SCIENTIFIC AMERICAN

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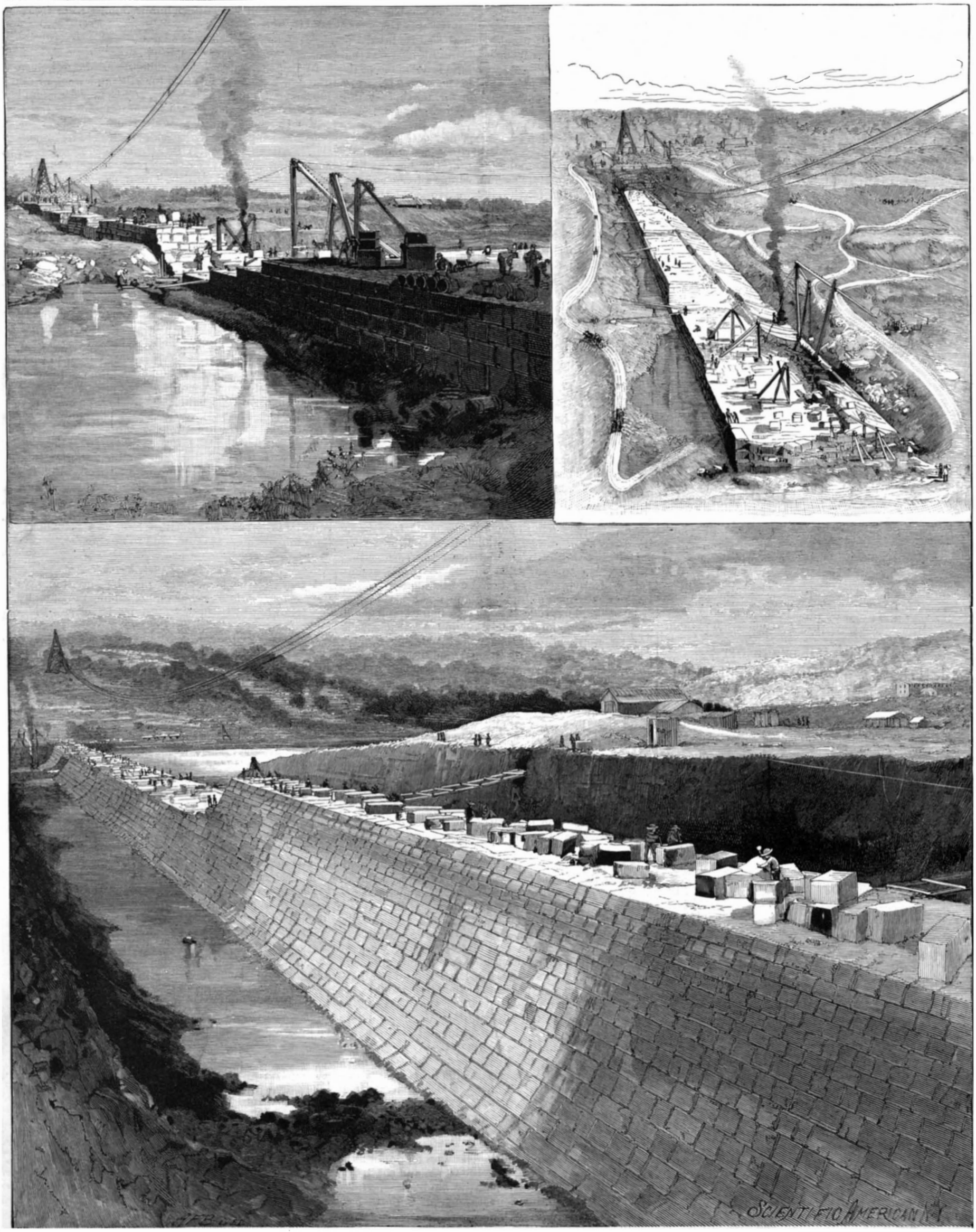

THE GREAT DAM ACROSS THE COLORADO RIVER, AT AUSTIN, TEXAS.—[See page 197.]

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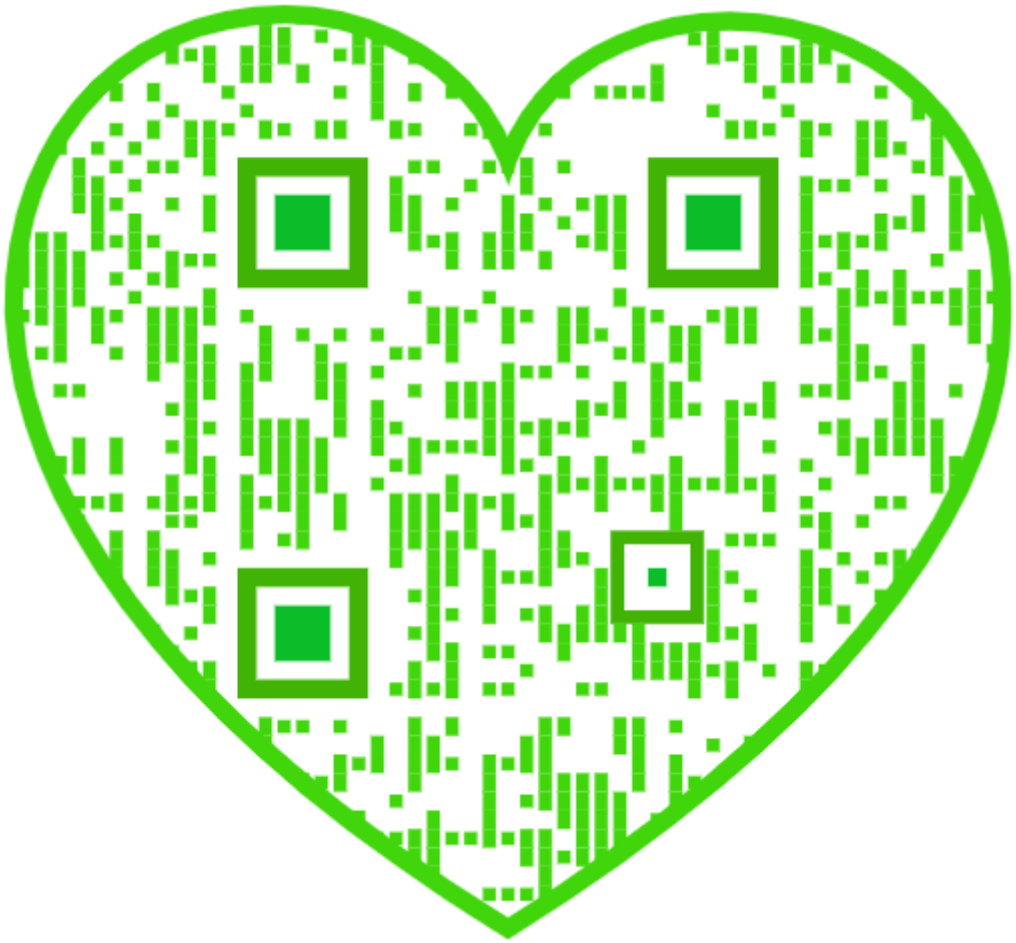

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ADVANCE OF POLAR EXPLORATION.

The expedition of Lieut. Peary for the exploration of North Greenland, which left New York June 6 last year, accomplished one of the most successful Arctic trips ever made, and arrived at St. Johns, Newfoundland, on its return, September 11. The surprisingly short time in which the expedition was made, and its small cost, as compared with previous Arctic voyages, are especially notable, for it will be remembered that the explorers consisted only of Lieut. Peary and his wife, and five men, taken out by the Kite, a small and stanch steam vessel, and left, in August last, at a depot established on McCormick Bay, on the west coast of Greenland,* at 77° 20′ north latitude.

The plan of Lieut. Peary's expedition was based upon the theory that nearly the whole interior of Greenland is covered with an uninterrupted ice cap, nearly or quite co-extensive with the land, and his idea was that the northern terminus of Greenland is not north of the 85th parallel of latitude. On this ice plateau he proposed to make his journey to the far north, traveling on skiers or Norwegian snow shoes, and dragging sledges, starting on the journey with the northward movement of the sun in the spring. His experience was entirely confirmatory of his previous conjectures.

During September and a part of October the little party made themselves as comfortable a home as possible in preparation for the cold and storms of the long Arctic night, at the beginning of which they had a supply of thirty-one reindeer, several seals and walrus, and hundreds of birds in the larder, with a warm, snug house to shelter them. Natives came and settled near them, and the winter passed rapidly, there being in the middle of February a furious rain storm during which the temperature rose to 40° Fah. During March and April the temperature ranged at 40° to 50° below zero, and up to May 15 the time was occupied in removing the inland ice supplies and equipment to the top of the ice cap at the head of McCormick Bay, at an elevation of some 4,000 feet.

The real start over the ice cap was made on May 15, Lieut. Peary and Astrup, the Norwegian, going together, and leaving the others of the party as supports in charge of the stores, etc. On May 24, the edge of the great basin of the Humboldt Glacier, about 130 miles away, was reached. At midnight of May 31, Petermann Fiord was seen from the edge of its great glacier feeder basin, and eight days later was seen the land at the head of St. George's Fiord, two weeks longer being required, owing to storms, fogs, crevasses and steep ice slopes, to weather the feeder basins of the St. George's and Sherard Osborne glacier system. On June 26, at the 82° parallel, land confronted the explorers to the north and northeast and east, so that their course was deflected to the southeast, and on July 4, after three days' travel overland, a great bay was reached, opening out east and northeast, in latitude 81° 37′, longitude 24°. It was named Independence Bay, in honor of the day, and a great glacier flowing north into it was called Academy Glacier. The land around the bay was red and brown in color, almost entirely free of snow, and covered with glacial debris, flowers, insects, musk oxen and game being abundant. On July 9, the explorers started to return, taking a more inland route, and in seven days were struggling through snow and wrapped in snow clouds at an altitude of over 8,000 feet on the great interior plateau, from which they descended to the east of Humboldt Glacier. In seven days more, traveling at the rate of thirty miles a day, McCormick Bay was reached, the explorers there meeting Prof. Heilprin and his party of the Greenland Relief Expedition sent out this year. The journey of 1,300 miles over a portion of Greenland never hitherto covered was at an end.

Perhaps the most unfortunate feature of the expedition was the loss, a few days later, of young John M. Verhoeff, a promising mineralogist, who, in what was intended as a brief geological trip, a few days before the return, is supposed to have perished in one of the numerous glacier crevasses. In the words of Lieut. Peary, "With the exception of this sad accident, the expedition has been throughout most fortunate, and has carried out almost to the letter the original programme. The convergence of the Greenland coasts above the seventy-seventh parallel, the deflection of the main divide to the northwest above the same parallel, the termination of the continental ice cap below Victoria Inlet, and the existence of large glaciers in all the great northern fiords are among the discoveries. The expedition brings back much ethnological material, including tents, costumes, sledges, kayaks and dogs of the northern Eskimo, meteorological and tidal observations, and a large number of photographs of natives, dwellings and costumes, and Arctic scenery."

There seems to be but little room now for doubt as to the extent and direction of the Greenland coast, the northern limit of which was probably reached by Lockwood and Brainard in 1882, at 83° 24′ north latitude. When Peary started homeward from Independence Bay he was less than two hundred miles southeast of this point, and had for four days paralleled the coast in a southeast direction. The unexplored region stretching to the pole from the north of Greenland, where the nearest approach to the earth's northern axis has been made, includes a distance of about 450 statute miles; from Petermann Land and Spitzbergen, lying to the north of Europe, the distances to the pole are respectively about 500 and 560 miles, while toward Asia the Henrietta Islands, discovered by De Long, are some nine hundred miles distant from the pole. The great Arctic Ocean, still practically unexplored, stretches nearly two thousand miles from Spitzbergen to Alaska, and some fifteen hundred miles from Greenland to New Siberia.

* Full particulars of the equipment of the expedition, and what it proposed to accomplish, are given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 808.

A New Bleaching Process.

In the *Faerber Zeitung* a short description is given of a new bleaching medium for silk and wool, or for fabrics containing those fibers. This new compound is sodium superoxide, which would probably be represented by the chemical formula $Na2O_2$, and is analogous to barium and hydrogen peroxides in its properties. All these bodies bleach by virtue of their containing an excess of oxygen ready to act upon any coloring matter with which it may come in contact. The advantage which the new sodium superoxide has over the old peroxides can be seen when the amount of active oxygen contained in each is compared. Hydrogen peroxide of the usual twelve volume strength contains 1·5 per cent of active oxygen; barium peroxide contains 8 per cent, while the new sodium superoxide contains 20 per cent. It is sent out in the form of a white powder, readily soluble in water to a strongly alkaline solution, which, on adding acids, forms a clear neutral liquid containing peroxide of hydrogen. This can be used for bleaching by the ordinary well known bleaching processes. A method of working consists in taking from 10 to 30 per cent of the sodium superoxide, adding 30 per cent of Epsom salts, the percentages being of the weight of the fiber which is being bleached. For wool and ordinary silk, about 10 per cent will be required; for tussur silk, 30 per cent, on account of the darker color of the fiber. It takes from two to three hours to bleach with this new material, a much shorter time than is required for peroxide of hydrogen, while the bleach is just as effective. It is rather hygroscopic, and, therefore, has to be stored with great care, but, with proper storage, it is very stable, being much superior in this respect to either hydrogen peroxide or barium peroxide. It is also said to be cheaper.

Photographic Frost Pictures.

A very effective background may be imparted, says the *Photographic News*, to photographic portraits by the following method, described by Mr. Franz Pfennigberger in the *Phot. Rundschau:*

A concentrated solution of magnesium sulphate in beer is prepared, and the solution is boiled down for a short time, in order to have the saccharine principle of the beer, which serves as a cement, slightly in excess. The preparation, if stored in a well stoppered bottle, keeps well. The photograph is then treated in the following manner:

The figure is masked in any convenient way, leaving the background open, and the latter is quickly coated by means of a broad brush with the solution. It is well to apply it a little thicker around the shoulders, in order to produce there a more vigorous crystallization. After all has been coated, the picture—which may be printed on any kind of silvered paper—is laid aside. After about ten minutes, the formation of crystals will be completed, and, at the same time, the layer will be dry. The picture is then, by means of a pad of fine cotton, dusted with gilt bronze. If it is desired to strengthen some portions of the picture, it is only necessary to breathe upon them. Finally, the superfluous powder is carefully dusted off, when the portrait will appear on a bronzed ground covered with frost-like crystals. To protect the picture from being injured, it is necessary to coat it with matt varnish. The gilt bronze may be replaced by any other suitable powder, and the crystallization may as well be applied to the film side of the negative instead of to the print. In this case the crystalline forms will appear lightly on a darker ground, which also gives a good effect.

A New Anæsthetic.

A new anæsthetic, similar to cocaine, has been found in *eugenol-acetamide*. By successive reactions eugenol is changed into eugenol-sodium, eugenol-acetic acid, ethyl eugenol-acetate and eugenol-acetamide. Crystallized from water, it forms lustrous scales; from alcohol, delicate needles melting at 110° C. Applied in the form of a fine powder, it produces local anæsthesia, without any caustic action; this effect, in conjunction with the strong antiseptic property of eugenol-acetic acid, speaks for the new compound securing a place in the treatment of wounds. Patents for its preparation have been applied for by the Faerbwerken.—*Pharm. Centralhalle; Am. Jour. Pharm.*

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The Volatilization of Quartz.

It is not so very long ago, says *Industries*, when the fusion of quartz was considered to be a feat sufficient to warrant a good deal of interest being displayed in the mode of manufacture as well as in the electrical properties of the quartz fibers with which the name of Mr. Boyes became so intimately associated. Now we have gone a step farther, and soon not only the fusion, but the distillation, of quartz may become an every-day occurrence. Dr. Seger, the well known German ceramic technologist and editor of the *Thonindustrie Zeitung*, has published a paper in which he claims to have volatilized quartz in an appreciable quantity. It is noteworthy that the furnace employed was by no means a particularly sensational instrument. One would have expected that for an undertaking of this kind the very latest variety of electric or oxygen injector furnace would have been used, but the furnace actually chosen was of an older and more conventional type. It was of what is known as the Deville pattern, and consisted of a simple cylindrical sheet iron case lined with dead-burnt magnesite, leaving an internal cavity of about 5 inches diameter and 11 inches high. The magnesite lining only extended about two-thirds the length of the cylindrical casing, which was divided at that point by a perforated iron plate, forming the floor of the furnace proper, and supporting the crucible.

Below this division was the air chamber, into which a blast was injected by a side opening, and which served for the preliminary warming of the air before it came in contact with the burning fuel. The crucible was of carbon, and was inclosed in another of magnesite. The fuel used was retort carbon, and was kindled by a few fragments of burning charcoal. The quantity of the former used was 4 kilogrammes, which is certainly a very moderate expenditure. After the experiment it was found that the quartz had undergone fusion, to judge by its appearance, and was noticeably smaller. When weighed it was found to have been reduced to the extent of over 40 per cent, the total mass taken being about 2·5 grammes, and the quantity that had disappeared amounting to 1·1 gramme. That this was in no sense due to accident was proved by repeating the experiment with another piece of quartz, with a precisely similar result. The comparative constancy of the loss might lead to the supposition that there was some limiting factor in the volatilization; but a second heating of the same test piece caused a further loss of about 15 per cent on the original weight, and on repeating the heating twice the piece of quartz vanished altogether.

It was observed in the course of the experiments that when the quartz was cooled rapidly it had an opaque, porcelain-like aspect, while when the cooling took place gradually the test piece was perfectly transparent. The results we have recorded are sufficiently startling, and if they had emanated from a less careful technologist than Dr. Seger, would be regarded with some doubt. Even as it is, one cannot help wishing that further details were forthcoming, to set at rest the supposition that some of the basic material with which the furnace was lined may have obtained access to the inner vessel, and by fluxing the silica have rendered it sufficiently fluid to soak into the substance of the crucible. The one way to clinch the matter is to ascertain whither the lost silica goes—in fact, to turn the volatilization into a true distillation. Who knows, when silica is fractionally distilled, of what homologous, but not identical, bodies it may not prove to be composed?

Electric Spark Photography.

Professor Vernon Boys lately brought together in the United Presbyterian Church Synod Hall, Edinburgh, a monster audience to hear his lecture, with experiments, on "Electric Spark Photography." In the course of the lecture Professor Boys explained that by the electric spark articles moving at the rate of 10,000 miles an hour can be photographed, and by the introduction of a revolving mirror a speed of 180,000 miles an hour can be coped with. The mirror makes 1,024 turns every second, worked by electricity, which is equal to about 150 times as fast as a rifle bullet travels. The whole photographic power of the spark is over in a time equal to the ten or eleven millionth part of a second, and it is during that incredibly brief space that the image is made on the sensitive plate.

CHLORIDE of gold and sodium is recommended by Dr. Boubila as a remedy in progressive general paralysis, augmenting the chances of resistance and retarding further development during the period of decline. It is given morning and evening in doses of 2 milligrammes in a potion of 120 gm.; after fifteen days the dose is increased by 2 mgm., until 1 centigramme is reached, which is continued for a fortnight. The treatment is then discontinued for a month, after which time it is resumed in the same manner. Under the conditions named these large doses are borne without inconvenience.—*Rev. Internat. de Bibl. Méd.; Am. Jour. Pharm.*

Bristol and the Chicago Exposition.

The people of the United States have designed their great exposition to illustrate their four centuries of development. They will make much of the discovery period of the new world and of the great pioneers who found two continents. Columbus will be first in their hearts, their memories, and their acclamations. And this will be entirely proper. His qualities were great as his achievements, and he is one the world may honor without reservation. It is not to his derogation that the people of Bristol propose to commemorate at Chicago the doings of the Cabots.

It is their opinion that the Columbian Exposition might have a Valhalla, and no individual god be any the less. They recall with pride that their ancient city was first in westward exploration; that their ancestors' money fitted out the first expeditions from England to the new world; that their fellow citizens were the devisers and leaders of the voyages. They say that the part of the Cabots in reserving to the Anglo-Saxon race the northern continent has hardly been adequately noticed in history; and that they wish to bring to the attention of the world, from honorable motives of national and municipal pride, the striking influence exercised by their forefathers over the future of the new world.

The two Cabot voyages, those of 1496 and 1497, have had comparatively little notice from chroniclers for several reasons. In the first place, to minds influenced by enthusiastic accounts of the doings of Columbus, the expeditions seemed barren of results. Again, there is confusion between Cabot father and Cabot son, and there is not the sharp identity necessary to make a hero. Sebastian, notwithstanding a long and brilliant career, passed alternately in the service of England and Spain, died unnoticed in the reign of Philip and Mary, and the voluminous records and careful maps that were the pride of his declining days disappeared without a trace. Had accident or chicanery left to us the diaries and records of Sebastian, there is little reason to doubt but that his niche in the temple of fame would have been forever held inviolate. Amid all the doubts and uncertainties of his almost unchronicled career we may discern one splendid fact, one momentous circumstance, fraught with results to the human race not to be computed by the finite mind, and far-reaching even beyond the bounds of time.

Sebastian Cabot pre-empted North America for the Anglo-Saxons. In a map drawn in the year 1500 by Juan de la Coso, friend and hydrographer to Columbus, the northeast coast is starred with five English flags, thus marking the Spanish admission of English rights, in virtue of prior discovery. Other considerations doubtless to some extent operated in preventing Spain and Portugal from attempting to extend their dominion over the north, but the primary fact was that England had established herself there. She was tacitly left to the free enjoyment of her territory. It is idle to speculate on what might have been the history of North America if Spain or Portugal had obtained a foothold there. It is probable, however, within bounds to say that if Chicago were speaking Spanish to-day it might not have so splendid a national development to celebrate at the coming festival.

The people of Bristol for over a year have been working at a plan for representing in a simple yet adequate way the share of their ancestors in the national glory of America. At a representative meeting held some months ago in the hall of the Society of Merchant Venturers (Sebastian Cabot was the first governor of the parent society in London), the whole matter was placed in the hands of a representative committee of citizens, who in turn delegated their authority to a sub-committee composed of those who by antiquarian studies were qualified to conduct such a matter intelligently. This sub-committee has held many meetings during the past few months, and has finally matured its plans. It decided to reproduce in Chicago some characteristic Bristol structure, and to display therein such illustrative memorials of antiquity as might be available.

After a careful inspection of such buildings as came at all within the purview of the plan, the final decision rested upon two mediæval rooms in the building now in the occupation of Messrs. Franklyn, Morgan & Davey. The building in times past was the residence of merchant princes, and these two chambers, the drawing room and the ante room, have been carefully preserved through the vicissitudes of time and the changes of fortune. They are paneled throughout in oak, elaborately carved and ornamented, decorated with rich friezes, and embellished with a profusion of chaste detail. The larger room contains a chimney piece of florid design, reaching to the ceiling, this latter being of an ornate workmanship in keeping with the general artistic opulence of the chamber. It is intended to reproduce these two rooms, exactly as they stand, in oak, with the carving done by hand. The reproductions will, in fact, be equal in artistic excellence to their models, and there will be nothing of sham or papier maché about them. It is proposed that they should be displayed as a separate structure, and the exterior will be in complete accord as to period and workmanship with the interior. The rooms, in themselves no mean display, will be used for the receiving of objects of antiquity associated with and illustrative of the discovery and colonial periods of American history.

It is to be regretted, of course, that the meager records left of the lives of the Cabots do not afford means for reproducing objects directly associated with them; but it is not even known in what house they lived, though their parish is recorded. The house that will be reproduced is believed to look down upon the very spot in the Avon whence their little vessel, the Matthew, weighed anchor for the unknown world; but more of personal association than this it has been found impossible to compass. Nor is it possible to obtain articles for the exhibition that have a direct relation with the explorers. Articles having even an apocryphal association with them are lacking. Under these circumstances the Bristolians have done the next best thing. They are collecting objects of authentic history connected with the times; and they have a great mass of material to select from which shall illustrate the close relations of their ancient city with the beginning and the development of the new world.

Their plan involves the expenditure of some 3,000*l*. They have had the co-operation of the Royal Commission, which has made them a grant of one-half this sum; and they are expecting further aid from the exhibition authorities at Chicago, to the extent of 500*l*. The remaining 1,000*l*. they expect to raise among themselves; and this, in view of the purely sentimental nature of the display, and of the prevailing commercial depression, cannot but be regarded as a handsome contribution to municipal pride. There can be no two opinions as to the interest that will attach itself to this exhibit; but we are not without some apprehension that the necessary funds will be subscribed, and in any case we think it would be a useless expenditure to provide a separate building for the installation of the memorial. The beautiful decorations would be in every way suitable for two of the rooms in the large building now being erected at Jackson Park for the headquarters of the Royal Commission, and if the memorial was installed there, a large expense would be saved the Bristol Committee and the Commission.—*Engineering.*

Locomotive Smoke Consumers.

As the result of experiments recently conducted the Pennsylvania lines west of Pittsburg are equipping their locomotives running, according to the *Railway Review*, into Chicago with a smoke-preventing device, which gives excellent satisfaction. The fire boxes are fitted with the usual steam jet entering both the front and rear, but instead of carrying air in with the jet which is taken from the atmosphere, pipes are carried to the ash pan, and the air taken from directly beneath the grates. The object of this is to avoid carrying comparatively cold air directly into the fire box, which must detract to some extent from the heat of the box. This will also lessen any tendency which the air might have to condense the steam and produce moisture in the fire box. A blower is placed in the smoke stack to operate in connection with the arrangement, the opening of one valve in the cab throwing them both into operation. It is the intention to use this attachment only within the city limits, where the smoke produced is a nuisance, and for this reason it is not made automatic, but is thrown in and out of operation by the use of a globe valve. The device has been carefully tested and appears to be effective in preventing the emission of heavy black smoke, and the engines are all being equipped with it as fast as practicable.

Amidol, a New Developer.

It can be used in a sulphite solution alone, without any admixture of free alkali, and thus dissolved it is sufficiently permanent to serve as a one-solution developer, being diluted for use with three or four times its bulk of water immediately before employment.

The stock solution in concentrated form is prepared as follows:

Distilled water	1,000 parts.
Sodium sulphite cryst	200 "
Amidol	20 "

Further diluted, and used with a small proportion of potassium bromide as a restrainer, the images can be made to appear with any required speed and the density modified merely by altering the strength of the developer; the resulting negatives seem uniformly clear and brilliant, without any trace of fog. It is easy to develop many plates in succession with the same solution. Amidol is specially suited for the development of gelantino-bromide prints.

Intensifying "Blue" Prints.

Captain Hemly recommends, for imparting greater intensity and brilliance to blue prints, an immersion in a solution of a ferric salt—perchloride of iron for example—of a strength of five per cent, the prints afterward being well washed.

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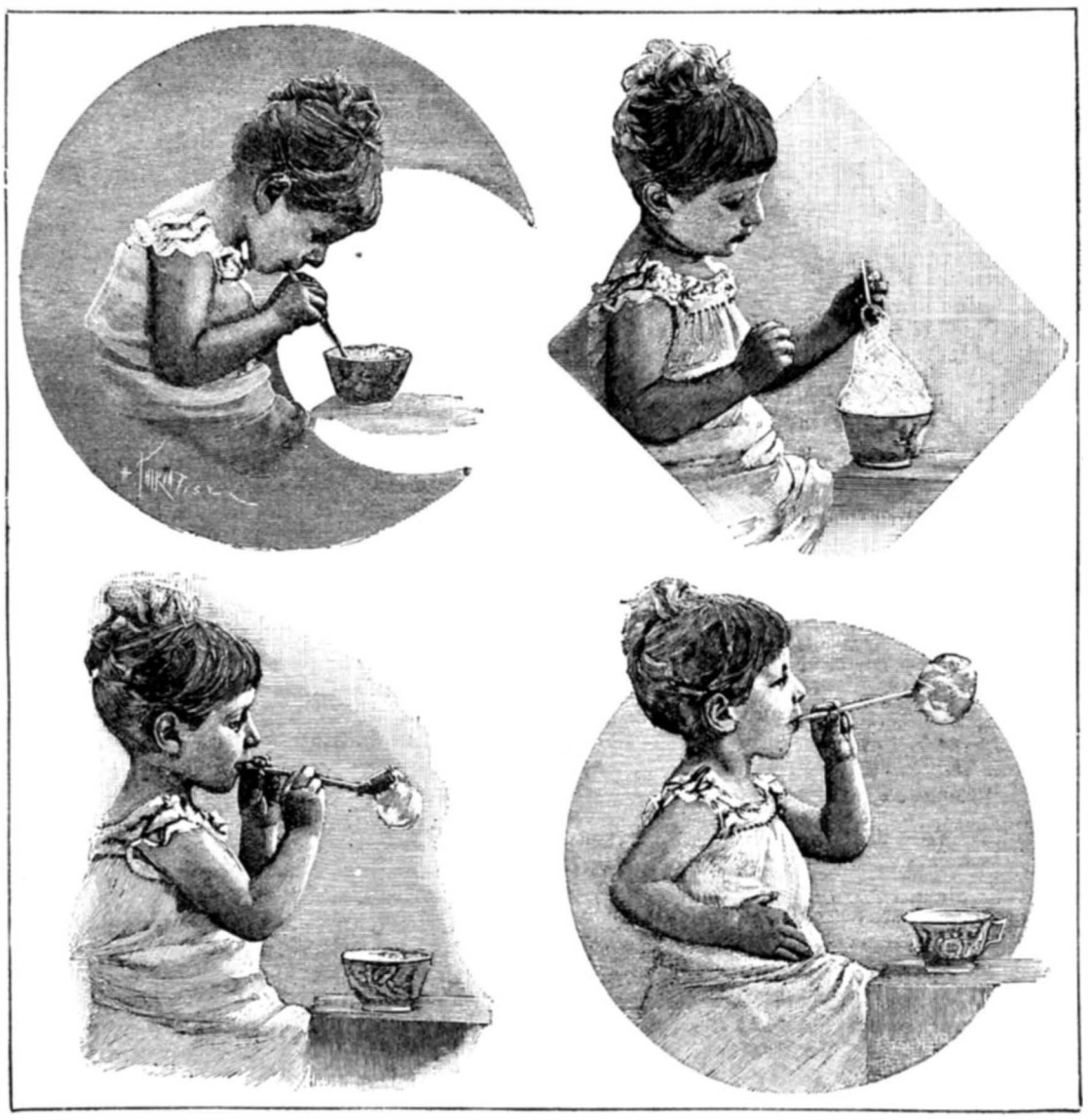
ART AND PHOTOGRAPHY.

Photography has sometimes been reproached for not being artistic, for presenting itself to the painter as a purely chemical process, and for giving merely mechanical reproductions of nature.

Such reproach may be just in a certain measure when it is a question of photographs taken by operators who are unskilled and devoid of taste; but when the operator himself possesses artistic feeling, he knows how to obtain true works of art that would do credit to the most delicate painter. Let us take as an example the pleasing photographs that we reproduce herewith, and that were taken by Mr. F. Boissonnas, of Geneva, and published in phototypy in the *Bulletin* of the Photo. Club, of Paris.

We give, in the picture, a fac-simile of them obtained by engraving upon wood. We preserve the crescent shaped, lozenge shaped and circular backgrounds that the operator added and that produce an excellent effect.

The little girl represented in the different attitudes of soap bubble blowing is a masterpiece of gracefulness, and were not this a photograph, the draughtsman of so charming a picture would be congratulated.—*La Nature.*



BLOWING SOAP BUBBLES.—(FROM AN INSTANTANEOUS PHOTOGRAPH.)

Epidermin.

Dr. S. Kohn (*Med.-Chirurgisches Centralblatt*, Vienna, April 29, 1892) describes a base prepared by himself, and named epidermin, which, he says, is especially valuable in dermatology. Epidermin is pure beeswax artificially compounded into a liniment with water and glycerin. It is a milky, half-fluid substance, which attains greater consistency upon being exposed to the air. Spread upon the skin, it dries in a few moments to a tenacious, elastic, and delicate pellicle. The glycerin contained in it causes it to retain these conditions. The preparations are kept in glass bottles with glass stoppers and wide necks. He compares epidermin with other substances in use, showing its advantages, and gives fourteen preparations, in each of which it is the basis.—*Ther. Gazette.*

CARR'S IMPROVED COMBINATION SURFACE GAUGE.

The combination surface gauge shown in the accompanying engravings is a decided advance over anything that has been accomplished in this direction before. In Fig. 2 is shown the swinging shaft which gives it a wider range than other gauges of the same height. After being set in any position it has a fine adjustment of ¼ to ⅜ inch, operated by the eccentric washer at the base of the shaft, which can be used without disturbing in any way the rigidity of the spindle. Fig. 3 shows how this tool can be adjusted to the edge of a planer bed, bolt slot or surface plate, to set work by or draw parallel lines.

It can also be adjusted to be used underneath work, using the top surface as a guide, and in laying out work on a lathe face plate, the V between the uprights of angle on top of base being adjusted to the edge of face plate when off the lathe, and one of the spindles being centered to be used on the lathe centers without the base, to locate and adjust work secured to the face plate. Figs. 4 and 5 show how it can be used as a depth or scratch gauge. As shown in Fig. 6, it makes a good scribing block for laying out small work by removing the spindle and inserting the needle in its place, crossways of the V, in the V place.

These gauges are made of the best material and finely finished. They are furnished in three sizes, 6 and 9 inch; 12 and 18 inch; and 30 inch, and are manufactured by the Hoggson & Pettis Manufacturing Company, of New Haven, Conn., the well known makers of the Sweetland chuck, Porter bell clamp, cutting dies, and other well known specialties. An illustrated circular and price list will be sent on application.

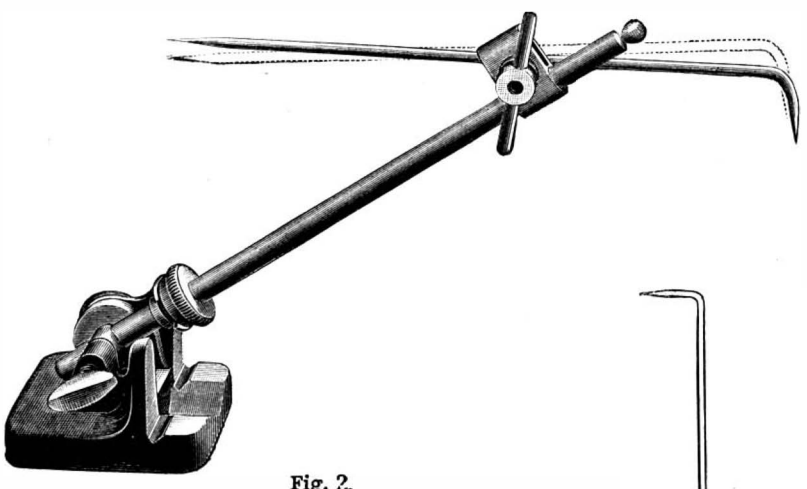


Fig. 2.

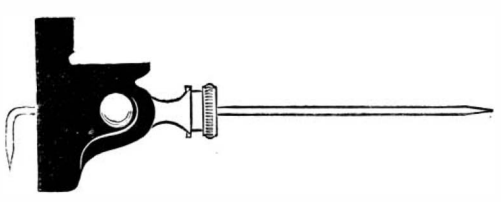


Fig. 5.—AS A SCRATCH GAUGE.

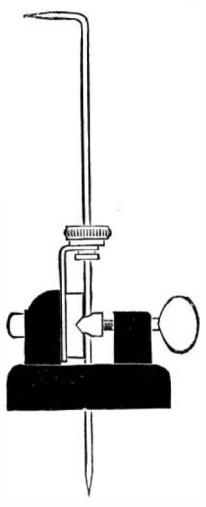


Fig. 4.—AS A DEPTH GAUGE.

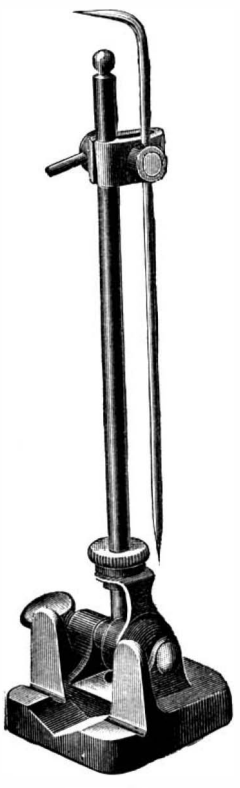


Fig. 1.

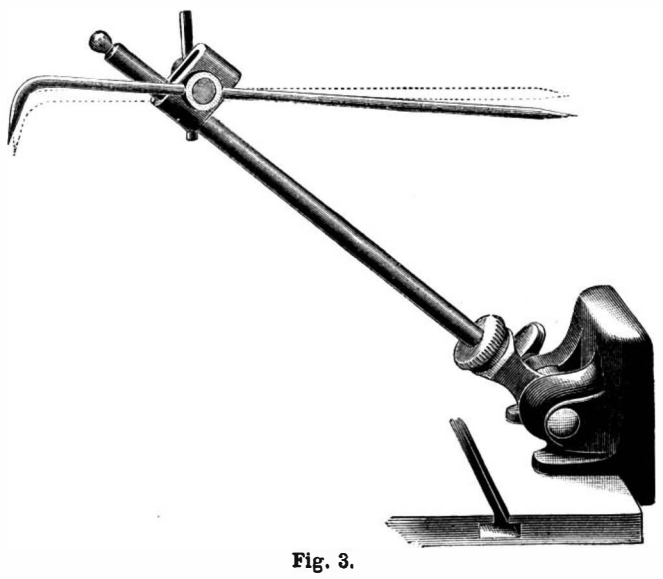


Fig. 3.

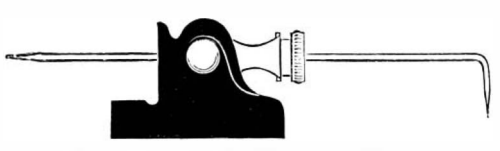


Fig. 6.—AS A SCRIBING BLOCK.

CARR'S PATENT IMPROVED COMBINATION SURFACE GAUGE.

Enameling Prints Without Gelatine or Collodion.

Mix oxgall and alcohol in equal parts without frequent agitation, and allow to stand two days; finally filter the resulting solution. Place the albumenized print in close contact with a glass plate coated with the above mixture. Drying will be complete in about one hour. The print can then be removed by peeling, and will be found to be highly enameled. To mount the print without loss of gloss, affix a sheet of paper to the back of the print while it is on the plate. The outside of the paper is then coated with gum or dextrine. When detached and pressed down upon a mount with a thoroughly damp surface, the print will be permanently mounted and yet possess all its high finish. It should be thoroughly rubbed down and passed through a cold burnisher with the print in contact with a zinc plate without flaw of any kind.—*Progres Photographique.*

Fortis Powder.

This powder is an explosive which is claimed to have an explosive force approaching that of dynamite and to be less inflammable and less dangerous than ordinary black powder. The principal constituents are nitrate of potash or soda 65 per cent, sulphur 13 per cent, charcoal 12 per cent, and binitro-benzine 10 per cent. Spent tan bark is used to replace the charcoal in part. The mixture is reduced to powder with great care. To granulate it or put it in cartridges, it is warmed in a basin heated by steam, water being added if necessary. To the above base, nitroglycerine, picrate of potash, or picrate of ammonia may be added to give it greater force. These substances make the powder pasty, which aids the formation of cartridges. This powder is patented in Germany under the name polynitro-cellulose and in France as benzoglyceronitre.

Relative Proportion of Females to Males.

According to the census report the whole number of males in the United States in 1890 is 32,067,880, and the whole number of females 30,554,370. For the United States as a whole, therefore, there are for every 100,000 males 95,280 females in 1890.

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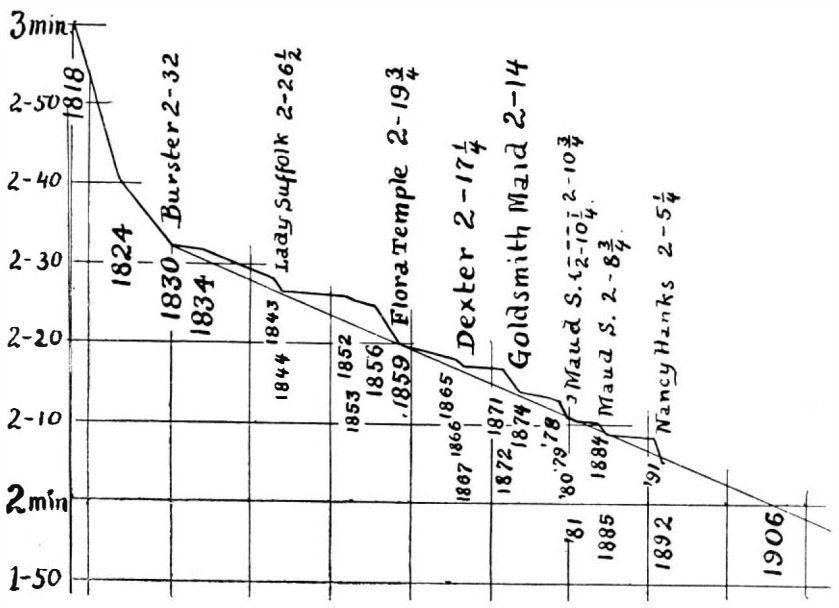
HOW HORSE TROTTING IMPROVES.

The recent lowering of the trotting record by Nancy Hanks to 2 minutes 5¼ seconds is a remarkable verification of a mathematical law that has been followed to a fraction of a second for the past sixty-two years.



This law is that the time to trot a mile is reducing at the precise rate of 11-26 of a second a year.

The accompanying chart illustrates how such a mathematical law is ascertained. The paper is first ruled with horizontal and vertical lines. The former are numbered consecutively with seconds from three minutes downward, and the latter are numbered with the years from the time when horse trotting commenced. Each noteworthy lowering of the record was next indicated on the chart, by placing dots at the intersections of the vertical lines indicating the years with the horizontal lines denoting the speeds. Only each tenth line is left on the diagram as printed to avoid too much crowding. The zigzag line in the upper corner joins the dots placed as above described. The mathematical law is ascertained by trying various curved and straight lines until the one is found which most closely follows the same general direction as the broken line. As the broken line makes an abrupt turn at 1830, and since trotting did not become an established sport until that year, it will be best to confine attention to that part of the line extending from that year forward. To it a straight line comes closer than any other, and such a line can be drawn so as to come within half a second of it at six points, beginning with Burster's record in 1830 and ending with the record made by Nancy Hanks last week. Such a line will represent the rate of improvement of 11 seconds in 26 years, and will show when extended forward what trotting speeds to expect in the future.

The trotting time for any year can be computed from this ratio as follows:

The difference is taken between the year for which it is desired to predict or verify the trotting speed and the year 1830, when the law began. This is multiplied by the fraction 11-26, and the product is the number of seconds to be deducted from the time, 2-32, made by Burster. Thus if it is desired to compare the record made in 1885 with this law, the difference between this year and 1830, that is 55, is multiplied by 11-26, or what is the same thing, multiplied by 11 and divided by 26. This gives 23·27 seconds, which deducted from 2 minutes 32 seconds leaves 2 minutes 8·73 seconds. In that year the record of Maud S. was taken at 2 minutes 8·75 seconds, thus agreeing with the calculation to within the fiftieth of a second. The record of Flora Temple in 1859 is equally close.

The greatest achievements of record breakers are given below in tabular form. By it the correctness of this law will be readily noted in the close agreement of the two columns headed "observed time" and "computed time."

Year.	Horse.	Observed time.	Computed time.
1830	Burster..	2-32·00	2-32·00
1844	Lady Suffolk	2-26·50	2-26·08
1859	Flora Temple	2-19·75	2-19·73
1867	Dexter	2-17·25	2-16·35
1874	Goldsmith Maid	2-14·00	2-13·39
1880	Maud S.	2-10·75	2-10·85
1885	Maud S.	2-8·75	2-8·73
1892	Nancy Hanks	2-5·25	2-5·77

In studying the above table it will be interesting to note the intervals between the record-breaking years. Since 1867 a remarkable smashing of records has occurred, and a record has been made in close accord with the above law of improvement every five to seven years. From these considerations a reduction of the record to 2 minutes and 3 or 4 seconds is to be expected about the end of the century and a reaching of the 2 minute gait in the year 1906. The innovations of the pneumatic sulky and the kite-shaped track however do not leave records that are now being made on the same footing with those by which the above law was deduced, and better records than are above indicated may therefore be looked for with these helps.

That the time required to trot a mile should go right on diminishing at the precise rate of 11 seconds in 26 years, and show not the slightest sign of diminishing, by which we might be able to observe that a limit is being approached, is indeed remarkable and unexpected, but the facts clearly show it, and we are left with no other guide to the future than they afford. This guide shows that in the year 2047 the mile a minute gait will be reached, and that 297 years hence it will be in order to race trotters with the lightning's flash.

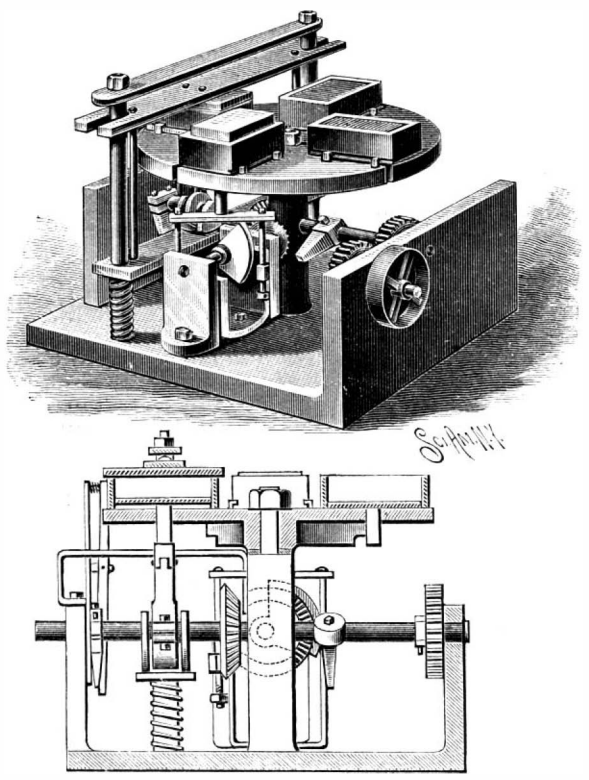
S. W. BALCH.

AN IMPROVED BRICK MACHINE.

The illustration represents an easily operated machine, patented by Mr. Howard Harlan, by which clay may be rapidly and firmly pressed into the form of bricks, which will be automatically ejected from the moulds. The driving shaft extends through a central vertical post, on the top of which is held a revoluble table having on its under side flanges extending into the path of an arm fixed to the driving shaft, by which the table is turned a fourth of a revolution at each stroke. The moulds are arranged around the table near its edge, being readily attached or removed, and in each mould is a vertically movable plunger having a stem projecting downward through the table. A vertically movable post, sliding in a guide bar, is operated by an eccentric on the drive shaft to press upward upon the stem of the plunger with a limited movement, sufficient to compress a brick, and simultaneously with this motion a vertically movable frame, operated by cams on the drive shaft, causes a cover mould to force the clay in the mould downward, so that it will be squeezed between the cover mould and the plunger.

One-fourth way farther around the table is an ejecting mechanism consisting of a sliding frame, actuated by a cam on a countershaft, and carrying a post adapted to raise the plunger to the top of the mould, whereby a brick will be ejected after compression at the next movement of the table. A greater or less number of moulds may be arranged on the table as desired, the machine being shown with four moulds, and the arm on the driving shaft striking a flange to turn the table a quarter way around at each revolution. The clay placed in the moulds is thus successively compressed and ejected therefrom.

Further information relative to this improvement may be obtained of Mr. George R. McCrea, of Renovo, Penn.



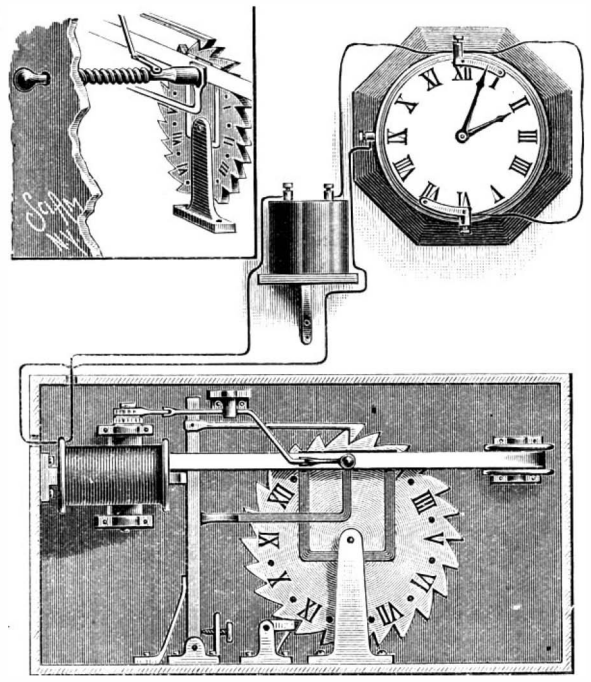
HARLAN'S BRICK MACHINE.

Caterpillars in Pill Boxes.

Mr. E. B. Boulton, F.R.S., fascinated the Biology Section of the British Association with the results of his experiments on caterpillars hatching in pill boxes. The pepper moth was the particular insect which he experimented on, and his experiments show that if you take an egg of one of these and grow it in a gilded pill box you get a golden caterpillar. Again, if the pill box be black, so is the caterpillar; while a mixed environment produced a muddled creature, just as in man the environment of the slum or the palace pretty much determines a person's characteristics.

A WATCHMAN'S ELECTRIC TIME RECORDER.

An improved apparatus designed to afford a simple and effective watchman's time check, to indicate the presence or absence of the watchman at a given point at certain intervals of time, is shown in the accompanying illustration, and has been patented by Mr. Emanuel R. Heyser, of Leon, Mexico. Electric contact strips are secured to the dial of a clock at opposite edges to cover a space equal to five minutes of time by the clock, the strips being in the path of the minute hand, and having binding posts connected with one pole of a battery, the other pole of which is connected with the electro-magnetic check mechanism, electrically connected with the movement of the clock. This check mechanism, in a casing beneath the clock, has a ratchet wheel on the side of which are characters corresponding with those on a clock dial, and intermediate projections for the half hours. The armature lever, which is prolonged above the armature, carries a hooked pawl to engage the ratchet wheel, and carries also an angled arm, the end of which is enlarged to form a platen adapted to cover the characters on the side of the wheel. A printing bar adapted to press upon this platen is shown in the small view, the bar being drawn out by its knob against the pressure of a spring, which throws the bar inward when the knob is released. A forked arm carries an ink ribbon in front of the wheel, opposite the characters, and in front of the ink ribbon is carried a strip of paper taken from a reel at one end of the casing and wound upon a reel at the opposite end, the latter reel being operated by means of spur and ratchet wheel connections to draw the paper along in connection with the pulling of the printing bar. A spring normally holds the armature lever against a limit screw, but when the minute hand of the clock



HEYSER'S WATCHMAN'S ELECTRIC TIME CHECK.

makes a contact with one of the contact strips on the dial, which occurs every half hour, the circuit of the battery is closed and the magnet in the casing is energized, drawing forward the armature, and moving the ratchet wheel one notch, bringing a dot or character opposite the printing bar, and moving the platen to position between the bar and the paper strip. By the pulling of the knob at any time in the five minutes while the circuit of the battery is thus closed, a corresponding record will be made upon the strip, but when the circuit is broken the armature lever is thrown back and the platen carried out of the path of the printing bar, so that no record can be made and the paper strip will show a neglect of duty on the part of the watchman.

Progress of the Telephone.

In Census Bulletin No. 196 is presented a preliminary report on operating telephone companies for the year ended December 31, 1890, prepared by Mr. Allen R. Foote, expert special agent for the collection of statistics of the electrical industries, under direction of Mr. Frank R. Williams, in charge of the collection of statistics relating to all branches of manufactures.

This report is deemed of special interest because of the great advance shown in this industry and the enormous increase developed in the demand for telephone service.

	1880	1890
Number of companies, firms, and persons reporting	148	53
Total investment	$14,605,787	$72,341,736
Gross earnings	3,098,081	16,404,583
Gross expenses	2,373,703	11,143,871
Net earnings	724,378	5,260,712
Number of exchanges	437	1,241
Number of telephones and transmitters	108,638	467,356
Miles of wire	34,305	240,412
Number of employes	3,338	8,645
Number of subscribers	48,414	227,357
Number of conversations		453,200,000

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Correspondence.

Snakes Within Snakes.

To the Editor of the Scientific American:

The following is respectfully contributed to the columns of the SCIENTIFIC AMERICAN, if thought worthy:

Ernest Welch and A. J. Johnson, two young men of veracity, were burning logs for us a few days ago near a stock water pond. On turning an old log from its bed there was seen what appeared to be our common vertically striped water snake, the individual being 3½ feet long and of full habit. Instantly one of the boys cut her in two with an ax. Now they noticed a number of young snakes, some of them cut in twain by the ax, issuing from the sections at the point of severance. Their curiosity being aroused, they took from the carcass, killed, adjusted, and counted forty-five young snakes, 9 inches long. They speedily drifted as investigators into the opinion that snakes were viviparous. They called me to the spot. I took the snakes on a board to the village doctor, where the opinion was rendered that they were undoubtedly oviparous. The doctor said that they had sprung from eggs hatched outside the body, and may have been taken in for purposes of warmth, mechanical protection, or alimentation. But it seems that they would soon smother in the stomach. Then the question arises: Is the snake in some of its varieties a marsupial? Has it a ventilated pouch? R. M. RAGAN.

Fillmore, Ind., August 30, 1892.

An Earthquake in Bermuda.

To the Editor of the Scientific American:

A curious phenomenon occurred here on Aug. 23, at about 10 minutes to 5 A. M. A solution of it would be most interesting, especially as every one seems to have a different theory.

I will begin by describing Bermuda's geographical position, formation, etc., well known to every scientific man.

Bermuda is of coral formation, about 22 miles in length and varying in breadth from 3 miles to 1 mile; very low, the greatest height above sea level being not more than 200 feet. Our nearest point of land is Cape Hatteras, distant about 650 miles. We are nearly opposite Charleston, S. C., and about 770 miles southeast of New York. We are supposed to belong to a range of submarine volcanic mountains, extending from South America to Europe, of which we represent the only peak (or portion of peak, sufficient for the coral insect to build on) above water. The soundings around us show some of the greatest depths of the ocean, somewhere about 5 miles. We are also *very* cavernous, in some parts to such an extent that cuttings in roads frequently have to be filled in every few feet with hard substances, etc.

There is evidence of there once being a severe earthquake here, about, I should say, 1400 (as near as one can come by dates corroborating the testimony of discoverers later on, about Columbus' time), nearly half of the island having subsided in a very remarkable way. Every now and then traces of cedar stumps (the native wood) and other well known roots of our island are dredged up by the large steam dredges used at H. M. dockyard, and layers of soil in which these stumps, etc., were embedded proving beyond all doubt the foregoing statement.

Earthquake shocks have been felt here pretty often, averaging about four or five within the last ten years. I have felt three or four myself, of a very gentle, undulatory type, with little rumbling.

Having stated these brief outlines, I will now describe the occurrence in a few words.

At the time above mentioned (10 minutes to 5 A. M.), about sunrise, a great many people were awakened and pretty well scared and jolted by a heavy explosion, described differently by different persons, followed by a severe vibrating of houses and contents, and then could be heard the distant rumblings, by some, as the shock (?) passed away. By the majority of people three distinct reports or explosions were heard. To me it seemed like a heavy blast under the house.

A remarkable feature was its almost local character, the center of the island, a space of about 8 or 10 miles (right across), feeling it most keenly.

We are connected with Halifax, N. S., by cable, but no news has been received of any volcanic eruption or earthquake anywhere in our vicinity.

The disturbance seemed to be immediately under us, and in one place was sufficiently heavy to crack a chimney.

Various conjectures are of course afloat, but the two only reasonable ones seem to be that it was either an earthquake or a meteoric stone falling in the vicinity in the sea. But several people were out of doors at the time, and although not quite full light, were not sensible of any glare, etc., which one would naturally suppose to follow that of an aerolite, and the size must have been enormous, in fact, unprecedented. Some imagined at the time that one of our large powder magazines had exploded.

One gentleman, who has experienced various kinds of shocks in the West Indies, declares it to be an earthquake of a severe type, *i. e.*, vertical (all shocks felt here before have been undulatory).

Can you help us in any way? About a week before this event we had a severe gale from the southeast.

We have plenty of evidence as to the rocking of the earth and several as to that of the sea in the harbor. I would ask, are earthquakes ever accompanied, preceded or followed by a noise similar to an explosion?

A. C. C. JONES.

Colonial Post Office, Hamilton, Bermuda,
August 30, 1892.

American Potash.

This was formerly an article, says Mr. J. U. Lloyd, of much importance, and was exported from the country in large amounts. The New England States were at first the principal producers of potash, Boston, where it is now of no consequence, once being the great export market. With the destruction of the forests the source of supply receded from the East, progressing into the West, where, until a comparatively recent period, more or less was manufactured, but at present only a few stray casks drift into the hands of wholesale druggists or commission merchants. However, contrary to general opinion, the manufacture of potash is still carried on in some parts of the Northwest on a considerable scale. In the neighborhood of the forest of northern Michigan, and in portions of the provinces of Canada, this substance is still systematically manufactured the year through. By "potash" is meant a substance containing 80 to 95 per cent of carbonate and hydrate of potash, the balance being made up of sulphate of potash, chlorides of sodium and potassium, and insoluble matter. About 70 per cent KOH is the standard which it is possible to obtain, but Mr. Lloyd found the average of many casks of first sorts came out at 58·4 per cent, and dealers would not guarantee more than 60 per cent, as they had not control of the "salting" which is practiced by makers. However, a strong protest improved matters during the last twelve months. A total of 504,138 lb. averaged 73·5 per cent KOH, three car loads averaging over 75 per cent KOH, while one car load averaged over 80 per cent. This is evidence that a standard of 70 per cent KOH is attainable. For generations it has been customary to add more or less salt to the contents of the potash kettle just before it is "melted down," and sometimes lime is also added. This not only increases the yield and helps to make it cake, but it improves its appearance. Good potash is generally opaque, of a dull gray, slate or bluish color, often streaked with red or greenish stains. It deliquesces on exposure to the air, and becomes slowly pasty. It is mostly (unless much lime is present) soluble in water. Sometimes it presents a whitish appearance in the center of the cake, and occasionally is honeycombed. This description will generally average 70 per cent and upward KOH. That which is largely mixed with salt is usually crystalline, often nearly white, pearly, and translucent, or of a beautiful delicate pink, and seems to be the most highly valued by those who judge only from appearances.

A Church-going Horse.

Dr. T. B. Redding, of Newcastle, Ind., writing to *Science*, says:

Can a horse reason, or does he act solely from instinct? Many believe that he has reason and intelligence; others attribute all his acts to instinct.

I have a horse, now nineteen years old, that I have owned thirteen years. Soon after I commenced using him, I noticed that on Sundays, whenever I drove him down town, he strongly insisted, by pulling on the lines, on going to the church where I had been in the habit of attending. I watched this disposition constantly after that, and on every Sunday since, when driven out, he has continued to do the same thing, and if left to his own will invariably goes to the church and stops. I thought it possible that he was guided by the ringing of the church bells, and tested him by driving him down town at all hours of the day, before and after the ringing of the bells; but the result was the same. He invariably insisted on going to church on that day, no matter how often I drove him down town.

In going to my office he never offers to go to the church except on Sunday, but on that day he invariably begins to turn south to the street leading to the church, from fifty to a hundred feet before reaching the crossing, and, if not checked, turns into the street and hurries to the church. He has kept this up for at least twelve years. He never does this on any other day than Sunday. In bad weather or in good weather it is the same.

He knows the meaning of many words, such as office, post office, school house, mill, farm, cemetery, church, apple, corn, grass, water, and many others. The fact that he knows the meaning of these words, or at least attaches a meaning to them, I have tested many times in many ways. When his corn is about used up, if I speak of it to him and say, "Deck, your corn is out; you must go to the mill," even before starting from home, he turns in at the mill as I go by, and goes up to the office door, where I have been in the habit of ordering his food.

He also knows a number of people by name and where they reside; and if told to stop at the residence of one of them, naming him, he will do so, without any guiding.

These are only a few of the many evidences of his intelligence. Hundreds of examples might be given showing his knowledge and intelligence, and that he gives very close attention to and understands what is said to him.

Do not these facts strongly indicate that the horse has more than mere instinct, that he reasons; that out of the storehouse of his knowledge and experience he forms conclusions, thoughts, purposes, and plans? He understands certain symbols, such as words; he keeps the run of time and knows uniformly when Sunday comes, for he has not made a mistake in this respect for more than twelve years past; he uses many and diverse means for making his wants known.

Instinct is supposed to imply inherited knowledge of objects and relations in respect to which it is exercised, and will usually, if not always, operate where there is no experience to guide. But this horse's knowledge, in these respects, has not been inherited, but is acquired.

Does the fact of his observing Sunday imply a moral sense? Why does he seek to go to the church on that day? It has been said that animals do reasonable things without having the gift of reason; that they do things involving distant foresight without having any knowledge of the future; that they work for that which is to be without seeing or feeling anything beyond what is; that they enjoy, but do not understand; that reason works upon and through them, but is not in them. The facts that I have related and observed make me greatly doubt many of these statements. I find it hard to sharply define the limits between instinct and reason. The facts that I have related indicate reason, intelligence, motives, and the formulation of plans, methods, and schemes for carrying out preconceived purposes. Some of the acts, at least, indicate pure reason based upon former and remembered sensations, perceptions, and knowledge, and the purpose to gratify merely mental desires.

What motives does this horse have for going to church every Sunday, even at a sacrifice sometimes? It is not for rest, it is not shelter, it is not feed, it is not company, it is not to gratify any merely physical want, for all these things he has elsewhere every day. It is not purely an intellectual or moral want that he seeks to gratify? He stands near the church door, hears much of the exercises, especially the singing, and will remain, almost without motion, whether tied or not, till the services are over, and I am ready to go home. But it cannot be for the mere speaking and singing that he hears there, for he often hears speaking, singing, concerts, the Salvation Army, and music of various kinds while he stands tied at the office on the public square; but none of these take the place of his church going.

The Alphabet in Writing and Printing.

The proportionate use of letters, as given in "Brewer's "Dictionary of Phrase and Fable," is as follows:

E	1,000	H	540	F	236	V	120
T	770	R	528	W	190	K	88
A	728	D	392	Y	184	J	55
I	704	L	360	P	168	Q	50
S	680	U	296	G	168	X	46
O	672	C	280	B	158	Z	22
N	670	M	272				

Consonants, 5,977; vowels, 3,400.

The proportion for initial letters is as follows:

S	1,194	M	439	W	272	J	69
C	937	F	388	G	266	Q	58
P	804	I	377	U	228	K	47
A	574	E	340	O	206	Y	23
T	571	H	308	V	172	Z	18
D	505	L	298	N	153	X	4
B	463	R	291				

For the New York City Cable Roads.

A visit a few days ago to the extensive iron works of the Walker Manufacturing Company, Cleveland, afforded a sight, says the *Street Railway Review*, which has never before been seen. More than 165 car loads of finished work, for the New York cable roads, is piled up in great stacks, to such an extent as to occupy all the available room even in these great shops. Imagine a line of completed work over 300 feet long, 25 feet wide, and in places 30 feet high, stowed away as compactly as possible, and including sections of immense 40 rope drive wheels, differential rims, pillow blocks weighing several tons each, shafting in 30 foot sections and 16 inches diameter, shaft couplers, bed frames large enough to furnish a foundation for a good sized house, sheaves, and a great variety of other parts. It is the largest amount of cable machinery ever massed in one factory at one time, and is a most interesting sight. The nicety of finish and the accuracy of adjustment are wonderful.

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THE AUSTIN, TEXAS, DAM.

There is being built across the Colorado River at Austin, the capital of the State of Texas, a massive granite dam, the object of which is to furnish the city with water works and electric light, and to also furnish manufacturing enterprises with cheap water power. This wonderful structure is being built by the citizens of Austin, who at a public election voted to bond the city in the sum of $1,400,000 for this purpose. The dam is 1,200 feet in length, and 60 feet high. It is 16 feet thick at the top, increasing downward and spreading out in a broad toe or apron, making its extreme width at the bottom 50 feet. The body of the dam is of limestone rock. The upstream face, down stream face, and toe are being made of granite. The capping will also be made of granite in as large blocks as can be handled, worked to regular shape. The entire work is being laid in hydraulic cement. The structure is being built to allow a depth of 16 feet of water on its crest, and the abutments on either end will go to that height. At one end of the dam the natural rock goes far above this. The other end is occupied by an artificial bulkhead, called the gate house, containing the sluices for drawing off the water. The wheels will be some two or three hundred yards from the dam, and the canal, which is being excavated in rock, will also be that length. The function of the gatehouse at the entrance to the canal is to enable the water to be shut out in case of repairs, and to prevent an overflow in time of floods. The water will be drawn from the penstocks through iron pipes, pass the wheels, fall into the wheel pits, and be discharged through underground races into the river. There will be three water wheels, forty-five inches in diameter, each capable of giving 600 horse power on a head of 60 feet. The dam is situated two miles above the city and will create a lake twenty-five miles long and from one-half to one-quarter of a mile in width. Mr. J. R. Frizzell is the chief engineer of this great work and T. J. Fanning consulting engineer. During the flood season the amount of water that will flow over this dam, it is estimated, will be 200,000 to 250,000 cubic feet per second, which is nearly equal to the volume at Niagara Falls, to wit, 275,000 cubic feet per second.

Our illustrations were made from photographs, for which and the above particulars we are indebted to Mr. W. W. Wilson.

In a report upon the work to the Austin board, made last year by Consulting Engineer Fanning, he recommended a modification of the profile of the dam, and remarks as follows:

"Not for its length alone, or its great area of flowage, is the dam remarkable, for in France we observe three longer masonry dams, at Buzey, Chazilla, and Gros Bois, 1,545, 1,759, and 1,805 feet respectively, and in Wales the Vyrnwy dam, 1,350 feet long, the latter being for the storage reservoir of the Liverpool water supply. Not in height alone, for in France there are three dams, in Spain two, in Belgium one, and in the State of California one masonry dam exceeding 150 feet in height. There are fourteen other notable masonry dams having heights exceeding 100 feet.

"But none of these dams are upon great rivers, and very few of them have any water pass over their crest. On the other hand, the Austin dam stands in the channel of the Colorado River, where it has 40,000 square miles of watershed, and will have floods of 200,000 to 250,000 cubic feet of water per second to pass from its crest to its toe. Your citizens will appreciate your responsibility when they learn that no dam in existence has to pass a volume of water, in flood, even approximating this, through so great a height. Limestone and sandstone yield rapidly to the eroding force of falling water. The evidences of this are abundant in the canyon of the Niagara River below Niagara Falls; of the canyon of the Genesee River below Genesee Falls; of the Mississippi River below St. Anthony Falls; and here, of the Colorado River across Travis Co., as well as in the channels of numerous streams that flow down each of the Rocky Mountain slopes. Such evidences admonish us that this great flood must not be permitted to have sheer fall through so great a height and act with a destructive force such as has heretofore created canyons, but it must be made to glide down the slope of the dam and not be permitted to exert the force due to its velocity except at such distance below the dam that the foundations will not be endangered.

"The profile of the dam shown to me seemed not to fulfill the required conditions for passing the floods, because of the slightly rounded or nearly angular form at the front of its crest. The diagram accompanying shows an advised modification of the profile of the upper part of the dam, which is better adapted to pass the flood in a gliding sheet down the face of the dam, and to deliver it to the lower level without a direct blow, and so that its velocity will be expended chiefly in a horizontal direction in the backwater below the dam, and in eddies at a safe distance below the toe of the dam. The lower part of the down stream face of the dam has a curve of 31 feet radius, to which low water surface is tangent. The central part of this face has a batter of 4·5 inches to the foot. The new profile at the top part, as suggested, completes the down stream face and crest of the dam with a curve of 20 feet radius, to which both the front batter and the surface of the pond at a level of the crest are both tangent, this curve ending on the crest at 5 feet from the upper angle of the crest. The upper angle of the crest is then rounded off with a smaller curve, and the entire front of the dam becomes a reversed curve of ogee form, the form of dam best of all adapted to pass a large volume of water through so great a height. The top curve conforms nearly to the theoretical form of a medium flood stream. At higher flood stages there will be a tendency to vacuum under the curved stream immediately after it has passed the crest, which, together with the pressure of the atmosphere upon the top of the stream, will keep the full flood stream in close contact with the curved face of the dam, and cause even the highest flood to glide down the fall without shock upon the face of the dam or the soft rock foundation."

At the Rate of Ninety Miles an Hour.

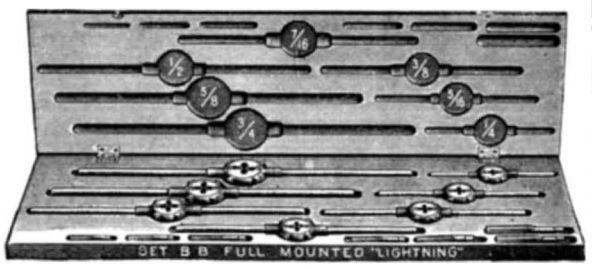
On September 1 the first train out from Buffalo on the Philadelphia and Reading road, according to watches held by the road's chief engineer and newspaper men and guests, made the phenomenal run of nine miles in six minutes, a speed of ninety miles an hour. The train ran only as far as Rochester, seventy-one miles, where it made connections through to the East. It consisted of an engine and two heavy passenger coaches.

Just east of Lancaster there is a long stretch of level track, and Engineer Randell pulled the throttle wide open and Chief Engineer Paul King and others held stop watches. They all showed the train had turned off nine miles in just six minutes.

All through to Rochester the run was phenomenally fast, and averaged a mile a minute. The road is one of the smoothest in this country, and the ninety-six pound steel rails are the heaviest made.

LIGHTNING FULL MOUNTED SCREW PLATES.

A new set of screw plates, shown in the illustration, has just been put on the market by the Wiley & Russell



LIGHTNING FULL MOUNTED SCREW PLATES.

Manufacturing Co., of Greenfield, Mass. These new plates have a stock of suitable size and weight for each die. The time and trouble of fitting and changing the dies each time is saved, and several sizes can be in use at the same. Each die may remain undisturbed in its place, ready for use until worn out in service, when another may be substituted, the stock remaining good.

Softening Water.

According to the *Dyer and Calico Printer*, there are two satisfactory methods for this purpose in use.

In the first process, hydrated baryta is placed in a filter press, which is traversed by the water to be purified, and produces an effluent showing only one or two degrees of hardness. Hydrated baryta, which is now largely used in sugar refining, and is easy to procure, precipitates all the bases, lime, magnesia, etc., as well as the sulphuric and carbonic acids, so that the carbonates and sulphates of lime and magnesia, which are the most harmful substances, are precipitated by one treatment.

According to the other process, hydrated oxide of lead is employed instead of baryta, and precipitates the carbonates, sulphates, and chlorides. It is necessary to obtain the hydrated oxide of lead cheaply, and the following method has been devised for this purpose:

A solution of sodium nitrate is placed in a vat, divided into two compartments by a diaphragm. Lead electrodes of large surface are placed in a solution, and a current from a dynamo is then passed through. The sodium nitrate is decomposed, caustic soda being formed in the negative compartment, and nitric acid at the positive pole, from which it dissolves a certain quantity of lead, forming lead nitrate. When the current has passed through the liquid for a certain time, the solutions are run from the two compartments into a second vat, and there mixed by means of an agitator. The soda precipitates hydrated oxide of lead, and itself forms sodium nitrate; the solution is then filtered, and the nitrate solution again submitted to electrolysis. When the baryta or lead oxide is used up, it is replaced by freshly prepared oxides. It is stated that the use of the filter press can be avoided by employing plumbate of sodium (a solution of lead oxide in caustic soda). The precipitate is simply allowed to settle out, and the water obtained shows a hardness of about two or three degrees.

Taffy Candy.

To four pounds of white sugar add one quart of water, place over a clear fire, stir till the sugar is dissolved, and boil it to the "crack;" when the sugar is at the "ball" add half a pound of good, sweet butter, cut in pieces, stir until the butter is melted and thoroughly incorporated in it. Flavor with extract of vanilla or lemon, and, when cooked to the "crack," pour it upon a buttered marble slab, and, when cool enough, cut it into squares or tablets.

CREAM TAFFY.

Another very fine and rich taffy is made by boiling the sugar with milk, or part water and part cream, instead of all water, using granulated sugar, and flavoring highly with extract of vanilla or lemon, the proportions of ingredients being the same as the foregoing recipe. These taffies may be flavored with chocolate, coffee, ginger, rose, or any fruit juice, and may also be made of maple or light brown sugar, according to the taste of the maker. The original "taffy," or "toffie," is of English origin, and was invented by a lady of the little town of Everton. The lady sent a sample of it to the Queen at Windsor, who immediately adopted it as the confection best suited for the royal nursery. This soon becoming known, all the ladies of the land immediately wanted it for a similar purpose, and the lady inventor was overwhelmed with orders for it, and soon acquired a handsome competence from its sale. Taffy remains to this day the most popular English confection. The manner of its preparation is as follows: Put half a pound of the best of sweet, fresh butter into a bright, clean copper pan, place it upon a moderate fire, and, as soon as melted, add and stir in with a wooden spatula two pounds of brown sugar, flavor it with the grated yellow rind of a fresh lemon and a pinch or two of powdered ginger, stir all constantly, but gently, until it is boiled to the "crack," then pour it upon a buttered marble slab, and, when sufficiently cool, cut it into squares, diamonds, or tablets. Four ounces of sweet almonds, blanched, and cut into fillets, and then thoroughly dried in the stove or oven, may be added to the above, thus forming a very delicious kind of nougat.

BUTTER SCOTCH

is simply brown sugar and butter melted together, flavored with extract of lemon, cooked to the "crack," and finished as taffy.

TO PREVENT CANDIES FROM BECOMING STICKY.

All boiled candies are liable to become sticky if exposed to the action of the air. They should be kept in closely covered jars or boxes. The best plan, however, that we know of to prevent candies, such as taffies, peanut bar, walnut bar, clear candies, nougat, and all similar goods, from becoming sticky, which is caused by their absorbing the moisture of the atmosphere, is that which we have always adopted when we desired to keep such articles for any length of time, and one that has always proved satisfactory: When the candies are first made, and cut into bars or pieces, varnish or cover each bar or article by means of a soft brush with a thin alcoholic solution of gum benzoin. Varnish them all over with this preparation and let them dry; this forms a thin, impervious skin on them, which effectually prevents the air from acting on the candies, besides it gives them a fine gloss. Benzoin has a fragrant odor with very little taste, and is easily pulverized; it is a stimulant and expectorant, and is sometimes used in pectoral affections. This varnish may be made in advance and kept in a closely covered jar or bottle, for use at any time. It is also an excellent varnish for glossing chocolate creams, etc.—*Confectioners' Journal.*

Galvano Plating with Iron and Nickel.

Mr. Capelle, the French chemist, recommends, according to *L'Industrie*, the following solutions for plating with iron and nickel: Solution 1st, for iron.—Take equal parts of pure sulphate of iron and of the sulphate of iron and ammonia, to which is added 1 in 1,000 of sulphate of magnesia. The solution should have a strength of 18° to 20° B. Solution 2d, for nickel.—To a solution of sulphate of nickel and ammonia, 2 per cent of sulphate of magnesia and 2 per cent of boric acid are added, and the solution is then neutralized with carbonate of magnesia. The bath should have a strength of 8° to 10° B.

Discovery of Another Satellite of Jupiter.

The Lick Observatory announces that Prof. Barnard has added a fifth satellite to the four satellites of Jupiter discovered by Galileo on January 7, 1610. It was discovered by Barnard on September 9. Its period is about 12 hours and 36 minutes. Its distance from the planet center is about 112,400 miles. It was observed by him on September 10, 20 hours 53 minutes and 20 seconds Greenwich mean time. Its magnitude is the thirteenth.

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IMPROVED REAPING, THRASHING, AND BAGGING MACHINE.

Necessity has truly been the mother of some of the greatest inventions. The requirements of the various fields of labor have been wonderful developers of man's ingenuity. This fact is most apparent in the vast harvest fields of North Dakota and California, where the sickle, and the cradle, and the flail, for so many centuries wielded by tillers of the soil, would not, even in the hands of an army of men, have been adequate to the requirements of the hour.

Here may perhaps be found one of the most, if not the most, distinctly American invention ever made, in the combined reaping and thrashing machine. A few years ago, a progressive farmer in the vicinity of Merced, California, not satisfied with the slow progress of his header and thrasher when operated separately, set his wits at work to devise a combination machine that would do the work of the two with one motor.

The result of his labor was a ponderous affair weighing eight tons and costing him $3,000. It did not work satisfactorily, and he rebuilt it at an expense of $5,000. This machine operated satisfactorily, but it required thirty powerful mules to push it. These mules were attached to a "push beam" fifty feet long and nearly as large as a ship's spar.

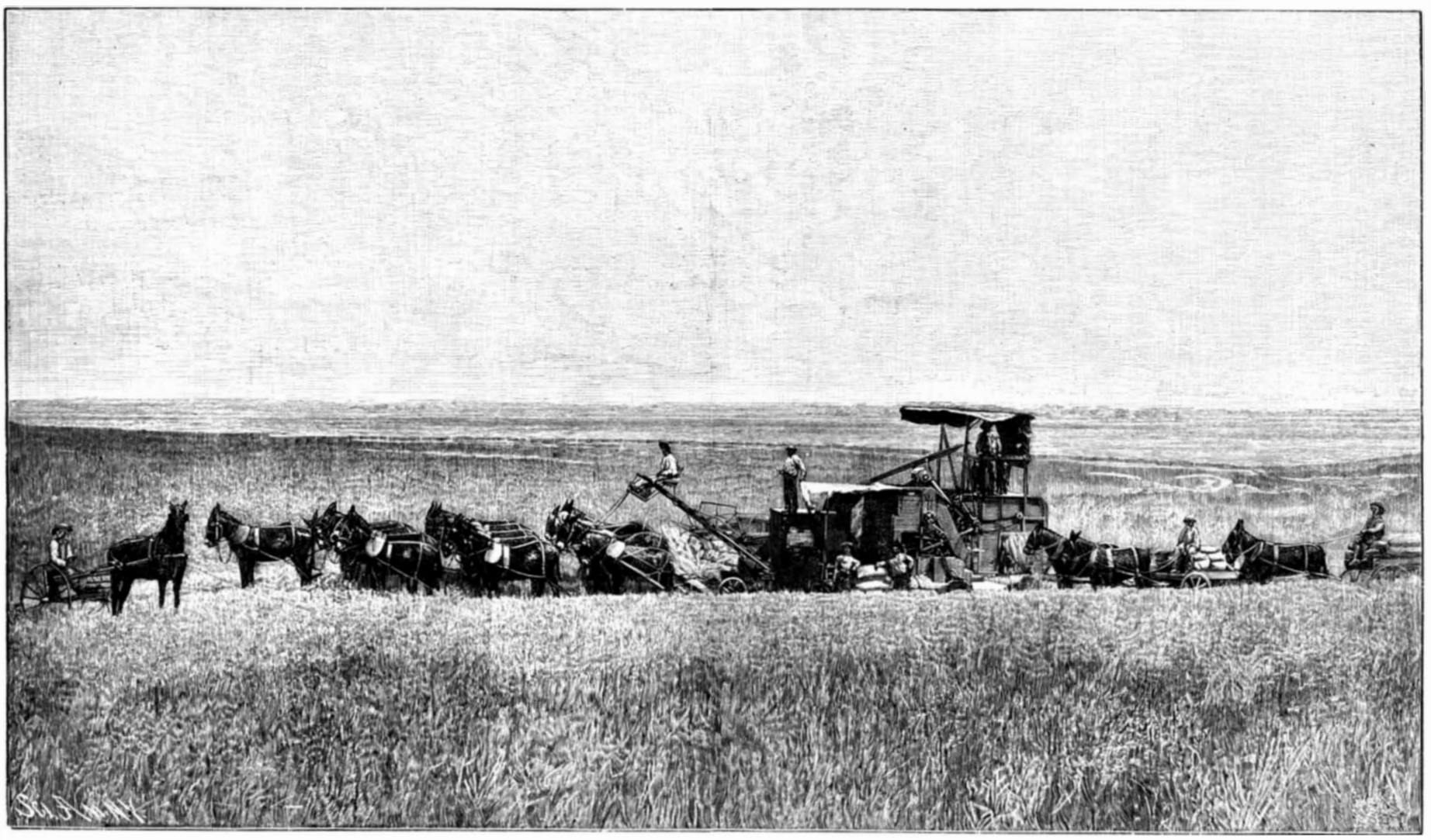
This cumbersome machine was so arranged that it could be steered by a man whose title was "helmsman." It required four men besides the mules to operate the machine. The cutting bar was twenty-two feet wide and the harvesting capacity of the machine was forty-eight and a half acres a day. The expense of operating this machine was, of course, large.

The ideas brought out in the construction of this machine were valuable, and inventive minds at once set to work to improve upon them, which they have done so successfully that, as compared with the bulky Merced machine, there are now combined reapers and thrashers that are compactly built and which are easily operated by seventeen horses or mules.

The amount of work that one of these machines is capable of performing in a day will seem incredible to those persons who have never seen them in operation; and to those agriculturists who have never seen anything swifter in operation than the cradle and the horse power thrashing machine, the sight of thirty-five of these monsters working at one time in a single field of wheat, as is frequently the case on the great Dalrymple farm in North Dakota, would be an astonishing revelation.

In one day of ten hours, seventeen mules will draw a combined reaper and thrasher twenty-three miles. The machine cuts 2·69 acres to the mile, which makes it capable of harvesting 61·87 acres a day. This would mean, in a year when the yield was fair, about 1,900 bushels of grain. This grain is garnered at the rate of 190 bushels an hour, or three and one-sixth bushels a minute, which is indeed a wonderful improvement in the speed with which the New England farmers prepare their grain for the market.

As the machine advances, the knives in the cutter bar clip off the heads of the stalks. These fall on a broad endless canvas belt that carries them to the cylinder or beater of the thrasher, which removes the grain from them. It drops through a series of sieves over and among which a rotating fan keeps a strong current of air moving. This removes the dust and chaff, and the grain pours in a steady stream through a trough into sacks which are sewed up and dropped on the ground to be picked up by teams that follow the thrashers. The work of each machine for the day, in an average field, is 950 sacks. Besides the mules it requires three men at a cost of two dollars a day each to operate each machine.



IMPROVED REAPING, THRASHING, AND BAGGING MACHINE.

Butter and Cheese Microbes.

In its relations to the operations of the dairy, the study of bacteriology has only just begun; but already, in so far as the work of bacteria has been looked for where it might be expected, it has been found. It has for a long time been known that milk is a most efficient means of transporting infectious diseases; as we now know, this is because its chemical composition adapts it so well for the nourishment, while in transit, of the microbes which are the actual carriers of the diseases. But their work is not all of this baneful character. Two illustrations must suffice; cream must undergo a certain change, called its ripening, before butter of the best flavor can be produced from it. The microbe that causes this change has been, at least to a large extent, separated from many others in the milk, and it is claimed that the pure culture of it can be practiced on a large scale in the dairy; the directions for this operation were first given by Weigmann, in 1891, with seed to be obtained from some bacteriological institute, and the use of this pure culture product is specially recommended at certain seasons of the year when it is particularly difficult to make good butter.

Again, in the ripening of cheese we should naturally look for the action of microbes. Several investigators have taken this matter up, but by far the most careful research was made by Adametz, and published in 1889. He identified twenty-eight species of bacteria in ripening cheese, and a very large number, 850,000, in a gramme of a hard cheese (*Emmenthal*), and 5,600,000 in a gramme of one of the soft cheeses. Two distinct kinds of change take place in the ripening of the cheese: the conversion of some of the insoluble casein of the fresh curd into a soluble and more digestible form; and second, the development of the flavor, by which one kind of cheese is distinguishable from another. If the curd is sterilized at the time when it is ready to be put away in the ripening room, and is there protected from infection, neither of these changes takes place; the dependence on microbial co-operation is thus established. Adametz was not able to identify any one species of bacterium as that one which exclusively produced the flavor of the one kind of cheese or of the other. The most he could establish was that the solubilizing of the curd was effected by one or more kinds, and the production of the flavor by one or more other kinds. A great amount of work remains to be done in this special field alone.—*Pres. Caldwell's address, Am. Chem. Society.*

Gold Waste of Value.

When the American Waltham Watch Company moved to new quarters in May last, they left behind a snug fortune in the old buildings in Bond Street, this city, in the shape of minute particles of gold among the old rubbish and in the cracks of the pine flooring. The precious metal has been reclaimed, however, by the Irvington Smelting and Refining Works, at Irvington, N. J., in the form of bars of yellow gold. The total value of the gold reclaimed is between $65,000 and $67,000. The gold recovered must have accumulated since 1879, when the factory was occupied by the firm. An average of 350 gold watch cases were turned out every day, each case weighing from twenty to fifty pennyweights. The gold was valued at eighty cents a pennyweight, and during a year it was estimated that more than $500,000 worth of gold was used in the manufacture of watch cases.

The water in which the workmen washed their hands, the mats on which they walked, and the towels with which they dried their hands and faces were carefully preserved, and at the end of every month were strained or burned and the residue afterward smelted and refined. About $1,000 a month was saved in this manner. Every summer parts of the flooring were taken up and smelted, and sometimes as much as $7,000 was realized in this way.

To obtain the gold concealed in the cracks and crevices in the old building, wagons were especially made to cart the old material from the factory to the smelting works, and every stick of wood in their premises was taken away. The planks of the floors were sawed into small pieces and then burned. The ashes were subjected to a chemical wash and the gold extracted.

The Volcano of Kilauea.

Dr. Sereno E. Bishop, in the September number of the *American Journal*, gives an account of a recent visit to this remarkable mountain. He says: The conical form of Halemaumau has become very distinct, and is strongly appreciated in the ascent to it on nearly every side. The volcano will soon be very accessible for tourists. The Hilo road is perfectly graded and rolled, and will probably be completed in a few months, when the drive to Kilauea will be one wholly of pleasure. The new hotel is a superior one, with lodgings for 70 guests. Plans are in progress for improving the walk over the lava. The whole is now in the hands of an active and enterprising corporation.

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THE STUDY OF THE STARS.

A. E. BEACH.

During the beautiful autumnal evenings few persons can look up into the starry dome of heaven without longing for a better acquaintance with the glowing orbs whose radiance meets the view in every direction. If one turns to the star maps and books of astronomy, there will be found clearly laid down the history, names, colors, magnitudes, and positions of all the principal celestial bodies. But when, after studying the map, he goes out of doors, thinking to carry the chart in his mind, and easily to locate and recognize

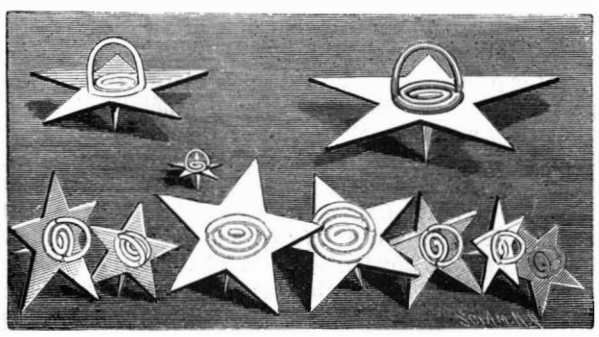


Fig. 3.—LUMINOUS STARS.

individual members of the glittering host, he is sadly disappointed. To his untrained eye the glorious stars appear the same as before, all mixed in inextricable confusion; and for him the map is of little value. Discouraged with the result of this first effort the majority of people abandon the matter and go through life without ever gaining an insight into this the sublimest of the sciences, and never experience the inexpressible delights that attend on this grandest of studies.

To assist the amateur, whether old or young, in the study of astronomy, to render the opening lessons easy and attractive, and insensibly to interest his mind in this most ennobling subject, has led me to design the simple devices which I will now describe.

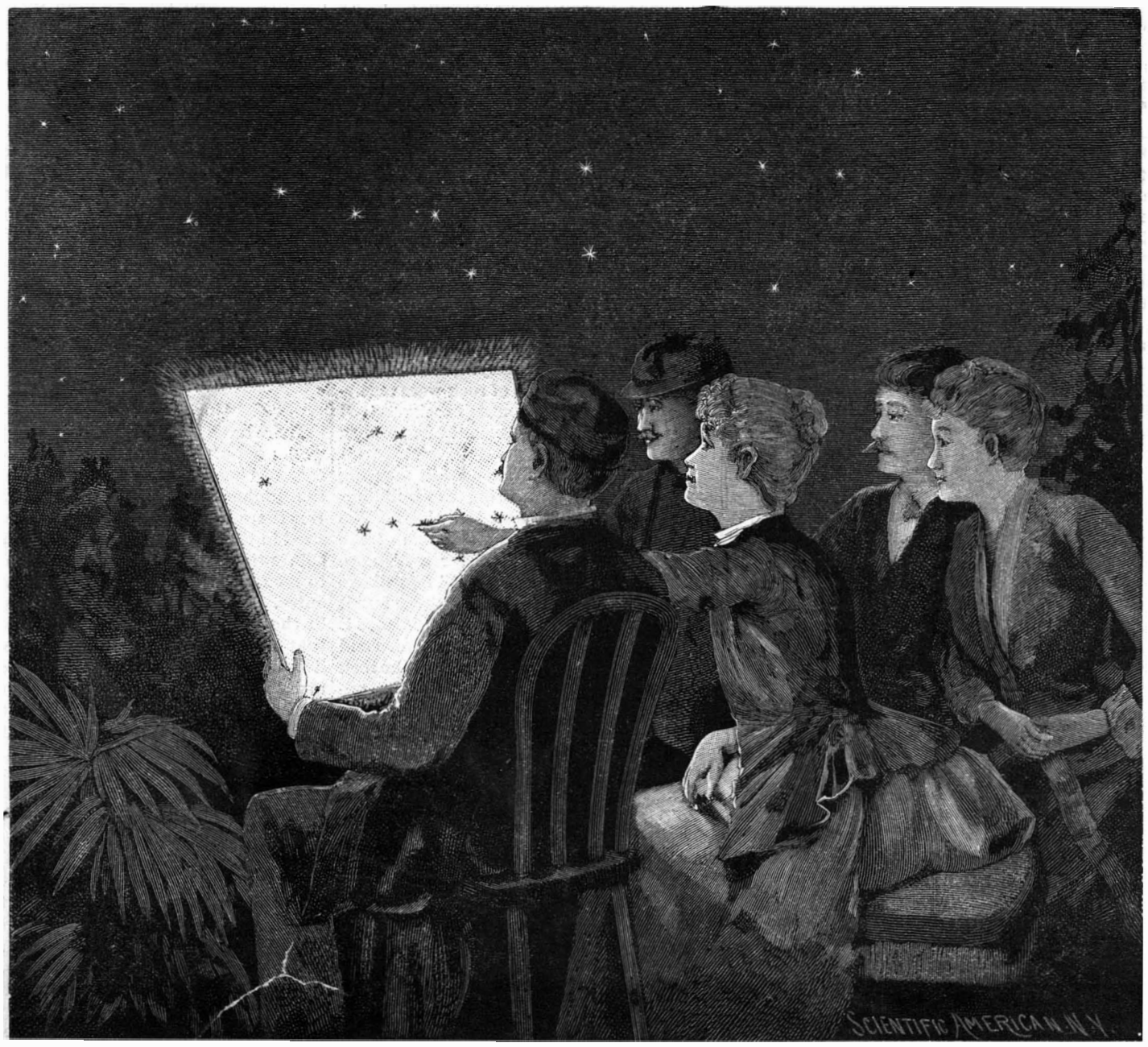
One form is as follows: I provide a sheet of cardboard, say two feet square, one side of which is covered with what is known as luminous paint. This remarkable substance has the quality of storing up the sunlight, and gradually delivering the same in the darkness. The paint is a chemical combination, chiefly of lime and sulphur. This luminous sheet I pin upon a light wooden board. I also cut out of common cardboard a few small stars of different sizes, to represent stars of the first, second, third and fourth magnitudes, and provide each star with a central pin.

In use the luminous board is held as shown in the engraving, and on it are placed the paper stars. The holder of the board glances upward at the sky, notes the position of the stars, and then arranges their counterparts upon the luminous board, the glowing purple light of which, even in the darkest night, enables him to do this with the utmost ease and satisfaction. The counterfeit stars being thus arranged and fastened upon the board, it is taken indoors and compared with the map or chart, with which the selected group is instantly recognized and named.

In this simple way the forms, positions, and component stars of all the principal heavenly bodies may quickly be learned by any person without a teacher; and the study, while it instructs and impresses the mind, is, in the highest degree, fascinating.

A still simpler device, but in the same line, is to cut the stars out of the luminous cardboard, and then arrange and pin them as before described upon the surface of a wooden board, say two feet square, painted dead black. In this case the movable stars will appear luminous on the board, even in the darkest night. This is illustrated in Fig. 2. Instead of using ordinary pins, wire round staples bent up as shown in Fig. 3 will be found convenient; these are easily fingered and quickly placed as desired.

A light, convenient, non-warping star board may be made by gluing together, crosswise, three sheets of pine wood veneers. It is needless to occupy space in describing all the uses of this device for promoting the first lessons in star study. Suffice it to say that with the contrivance in hand, together with star maps, such as those that were prepared for the SCIENTIFIC AMERICAN by the late Richard A. Proctor, any person may soon become an intelligent student of the skies; and his knowledge may be greatly supplemented and extended if, at the same time, he provides himself with the admirable book, "Astronomy with an Opera Glass," by that most excellent observer and writer, Mr. Garrett P. Serviss. This work, the Proctor star maps, and other desirable astronomical publications, may be had at the SCIENTIFIC AMERICAN office, book department.



THE STUDY OF THE STARS—THE LUMINOUS BOARD.

Medical Uses of Carrier Pigeons and Vaccination.

At the last meeting of the Academie de Medecine, Dr. Hervieux, who presides over the Public Vaccination Department at the headquarters of that learned body (vaccinations from the calf are performed gratuitously at the building in the Rue des Saints-Peres every Tuesday, Thursday, and Saturday) read a report by an army surgeon, M. Stroebel, on the transport of vaccine by carrier pigeons. It appears that one pigeon is capable of conveying in one journey from five to six tubes. The utility of this means of transport in times of war is very obvious, and one can imagine the joy of the representatives of the Army Medical Department at the apparition of a flock of these swift vaccine carriers in a besieged town.

Blue Transparencies.

Beautiful blue transparencies may be produced, according to M. Rossel, in the following simple way: Commercial cyanotype paper is exposed beneath the negative until the image will be very intensely visible, when it is thoroughly washed and placed for fifteen minutes in a ten per cent solution of bichromate of potash. After the print has again been well washed, it is allowed to dry, and then rendered transparent by placing it on a warm glass plate and treating it carefully with paraffin. The print is then framed between two glass plates. The above-mentioned cyanotype paper, giving white lines on a blue ground, may be prepared by placing plain photographic paper in a solution of 24 grammes of ammonio-citrate of iron and 25 grammes of potassium ferricyanide in 150 c. c. of water, and then drying it in the dark.

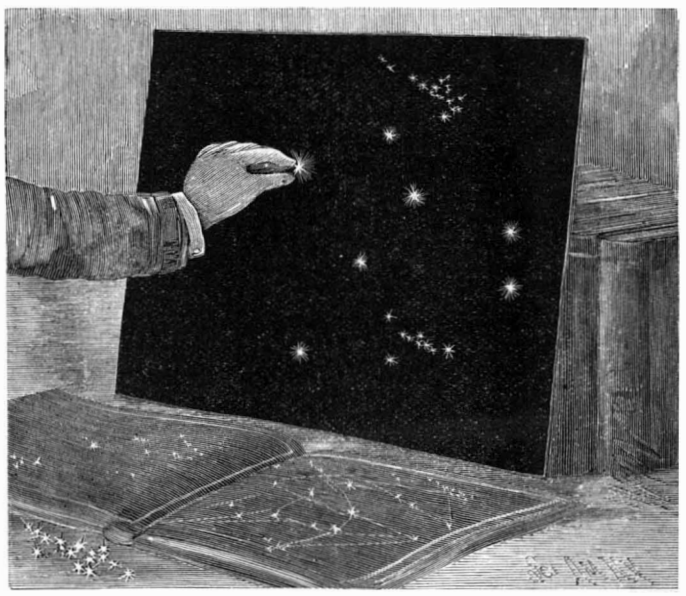


Fig. 2.—LUMINOUS STARS ON BLACKBOARD.

Tetanus Due to Hypodermic Needle.

An instructive case is reported in a recent number of the *British Medical Journal*. A patient who had been in the habit of injecting morphine hypodermically into himself came under observation with symptoms of tetanus, which eventually resulted in death. A careful search revealed no other cause for the tetanus than a small inflamed and suppurating place near the shoulder, which had been caused by one of the hypodermic injections he had given himself. The lesson taught by this case of the importance of the observance of scrupulous cleanliness, even in so small an operation as a hypodermic injection, cannot be too strongly impressed, and the memory of the disastrous effects which may result from the neglect of proper precautions should be firmly fixed in the mind of every practitioner.

THE ordinary hypodermic syringe is known in France as the *seringue de Pravaz*, the instrument having been invented by Dr. Pravaz, of Lyons, whose death is now announced.

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The Decay of Professional Photography.

Professional photography at the present time is admittedly not in a flourishing condition, and the causes commonly assigned for the depression include, of course, bad trade, severe competition and the influence of the once despised but now potent amateur. We fear, however, that a photographer himself is more often the cause of his own unfortunate position than are those we have just named. No parent in his senses would dream of apprenticing a lad to an ordinary photographer nowadays, and the reason for this strikes us as being equally available as an explanation of the ordinary photographer's lamentations over the smallness of his profits. In the establishment of such a man a clever, intelligent lad of fifteen or sixteen might pick up in the course of a year or so all that was to be learnt there, and probably a little more than his principal was competent to teach him.

For what is to be learnt in ninety-nine studios out of a hundred beyond lighting, posing, exposure, and development? The retouching, as one may gather from our advertisement columns, is generally put out; the printing is more frequently executed by trade printers than not, and in cases to the contrary is chiefly confined to one or, at most, two processes. Again, photographers who do their own enlargements are remarkably few; and, indeed, to sum up the average photographer's business, it may safely be laid down that most, if not all, the work and its numerous varieties is "put out." In such cases, which, we believe, form the majority, we submit that the apprenticeship system is bound to fail on account of the inability of the principal to impart any but a limited range of practical knowledge to the youth he is supposed to teach.

But this is not all. The mere taking of the negative is often, if not exactly, "put out," at least "farmed;" that is, supposing a portrait photographer to have an order for a landscape embracing a house, a piece of architecture pure and simple, an interior, or an *objet d'art*, etc., to photograph, he probably prefers not to undertake it himself, but to employ another photographer, who makes a specialty of such kinds of work, to produce the negatives for him. The growth of specialism in modern photography leaves the average professional photographer much in the position of a mere commercialist, with just the necessary superficial technical knowledge that will enable him to conduct his business with more or less success.

Of course, there are exceptions to the picture we are drawing, but we do not think they are sufficiently numerous to shake the accuracy of the outline. The race of photographers who collodionized and sensitized their own plates, sensitized their own papers, retouched their own negatives, did their own printing and enlargements, and in short carried on in their own establishments most, if not all, the work which to-day is "given out," does not seem likely to be perpetuated among the professionals of the present time.—*Br. Jour.*

Potschke's New Process of Photo-Sculpture.

It is now about thirty years since Villeme, of Paris, introduced his method of photo-sculpture, which it was hoped would revolutionize the plastic arts much in the same way that photography has revolutionized the graphic arts; but the practical failure arose from several circumstances, among which may be mentioned the difficulty of cutting the clay block by the guidance of the silhouettes, and the fact that some of the views taken by the circle of cameras must of necessity be so lighted as not to give clear outlines which could be accurately followed. The new process of Potschke seems to promise well. The model is placed on a turntable, and as a means of providing register for the various photographic silhouettes to be produced, a vertical rod accurately corresponding with the axis of the turntable is attached to the roof of the apartment, and terminates close to the top of the model or sitter. A thin horizontal ring also surrounds the model. A series of silhouette photographs being now taken with the turntable in the required positions, prints are made on stout paper, preferably the blue or cyanofer paper. These are cut out so as to make a set of guiding silhouettes in paper, which silhouettes are stiffened by repeated treatments with silicate of soda. A foot or base is now provided, in the middle of which is erected a cylindrical or axial rod corresponding to the gauge rod referred to as depending from the ceiling over the head of the model. Guided by the impression of the gauge rod, the silhouettes are cut vertically, a width corresponding to the gauge rod being removed, and they are then mounted on the axial rod attached to the foot, wedge-shaped gaps being left between. A horizontal ring corresponding to that photographed gives another register and point of support for the silhouettes, and also gives a means of measuring the angles so as to insure the correct position of each silhouette. In this way a kind of skeleton of the bust is built up in radial silhouettes attached to the vertical or axial rod. The next step is to fill the spaces between the silhouettes with clay or other plastic material, and, when the wedge-shaped gaps are nearly filled, the horizontal ring may be removed. By now modeling the clay to the outlines of the silhouettes, a sufficient approximation to the bust is obtained for handing over to the skilled work person who must finish it. The model thus obtained can be moulded and cast from by usual methods. It is easy to see how the method here indicated may be subject to wide modifications under various circumstances. It would seem perhaps easier and more satisfactory to cut out the guiding templets in sheet metal, and solder them to the central rod, than to use paper.—*Photographic Work.*

The Great Jetty Works at the Mouth of the Columbia River.

The project under which the work of improving the mouth of the Columbia River is being carried on was adopted in 1884. It contemplates providing a channel across the Columbia River bar, having a depth of 30 feet at mean low tide. This is to be effected by concentrating the water flowing over the bar, and increasing the resultant current to such a degree as to procure the desired depth. Any work for accomplishing this end must be more or less tentative in its character. The work which is now in progress is the building of a low-tide jetty, starting from Fort Stevens, on the south cape, and extending in a westerly direction, with a slight curve to the south, out across Clatsop spit, for a distance of 4½ miles, more or less, as circumstances may require, to a point about three miles south of Cape Disappointment. The jetty is constructed of stone, resting upon a mattress foundation about 40 feet wide and from 2½ to 5 feet thick. The stone extends to the level of four feet above mean low water. The material thus far has been placed in position from a jetty tramway supported upon piles driven along the line of the jetty and 24 feet above the level of low tide. The tramway is a double track, three foot gauge railroad, the tracks being 13 feet between centers and 28 feet above the plane of mean low water. The material is landed at the wharf, and transported to place over these tracks, which are built in advance of the main works. Captain T. W. Symons, United States Engineers, in his lastest report concerning this great undertaking, which has just been made public, says:

"Before the commencement of this work, the channel or channels over this bar were very capricious in location and variable in depth. The depths were usually from 19 to 21 feet, and the channels varied in number from one to three, and in location through nearly 180 degrees from Cape Disappointment to Point Adams.

"The results of the jetty already constructed are very marked in the building up of Clatsop spit, and in the effects produced by the concentration of water upon the bar. There is now a straight out-and-in channel, having a width of one-fourth mile, with a depth nowhere less than 29 feet, and for a width of one mile a depth of 27 feet. At the end of last fiscal year the shortest distance from the 30 foot curve on the outside to the same on the inside of the bar was 3,000 feet. This distance is now reduced to 1,200 feet. These depths refer to the plane of the mean of the lower low waters.

"Since the commencement of the work in 1884 there has been used in the construction of the tramway and its repairs 377,660 lineal feet of piling and 2,223,580 feet B. M. of lumber. The cost of the tramway has been approximately $6.50 per lineal foot. There has been used 18,414 cords of fascines. The mattress work in place has cost $4.50 per lineal foot.

"Under the contract, dated January 22, 1891, in force with Joseph E. Smith, 150,500 tons of rock were received during the year. The total amount of rock received from all sources since the commencement of the work is 478,890 tons.

"About 25,000 tons of this rock was used in securing the root of the jetty, and in protecting the buildings and railway between that point and the wharf. The balance has been distributed along the line of the jetty. From the end of the jetty back for a distance of 2,500 feet the rock is raised to a level of 4 feet above datum, for 13,000 feet it is at datum, for 5,200 feet it will average 4 feet above, for the remaining distance it will run from this level to high water. Near the inner end of the jetty it was found to be necessary to pile the rock well up toward the high water line, to protect the piling of the tramway from the heavy drift brought down by the river during the winter and spring. At places along the line of the jetty it was observed that there was a decided tendency during the last of the flood tides and the first of the ebb for the water to flow across the jetty in great volume and with considerable velocity. Where this was the case the sand would not deposit in the vicinity, but would be scoured out, increasing the area of the waterway. At these places rock was dumped in until this action ceased. It was found that when the jetty reached the height of about 4 feet above the mean level of low water the flow, during both ebb and flow, was under control. The sand was deposited to the level of low water and above—in many instances on both sides of the jetty.

"Under the contract entered into with Richard Hoyt, April 20, 1891, 1,768 cords of fascines and 3,528 poles were received. These were used in making the mattresses placed under the last 1,000 feet of the jetty.

"The piles used during the year were purchased in open market at the rate of 9½ cents per lineal foot, delivered at Astoria. The lumber was purchased in open market also, at $10 per M, delivered at Fort Stevens.

"It is estimated that $525,000 will be required to finish this work. Should $350,000 of this be appropriated for the fiscal year ending June 30, 1893, it is recommended that the balance, $175,000, be made available for the fiscal year ending June 30, 1894.

"The original estimate for the construction of this work was $3,710,000. Of this amount there has already been appropriated, to June 30, 1892, $1,337,500. There was a balance on hand at that date of $24,331.12, exclusive of outstanding liabilities.

"It is proposed to expend this and future sums appropriated in raising the jetty to a height of 4 feet above low water, in those places that are not yet at that height, and in farther strengthening the jetty. There is now about 13,000 feet that is at the level of mean low water. Experience has shown that it will not be safe to leave the jetty at this height. The first half of the tides flowing across the jetty, either ebb or flood, take the sand with them and scour channels. Especially is this the case where there are low places in the jetty. It is only by building up the jetty that this cross flow can be prevented. About 4 feet above low water seems to be the height required. The jetty toward the outer end will need to be protected with large rocks to resist heavy seas."—*Pacific Lumberman.*

International Congress of Experimental Psychology.

At the recent meeting in London, the president read part of a report of the census of hallucinations which, since the last meeting in 1889, has been actively carried on in England and to some extent in the United States, France, Germany, Russia and Brazil. To the question, "Have you ever, while in good health, and believing yourself to be awake, seen a figure of a person or an inanimate object, or heard a voice which in your view was not referable to any external physical cause?" 17,000 answers were received in England. It appears that about one in ten of persons taken at random had experienced hallucinations of some kind, the apparitions being mostly those of living people or unrecognized human figures. A remarkable class was that of collective apparitions, the same hallucinations being simultaneously perceived by two or more different people, although in some of these instances there seemed to be a possibility of verbal suggestion from one to another. But, after all deductions for possible sources of error, there was a strong presumption against chance coincidence, if ordinary accuracy on the part of informants was to be assumed.

Mrs. Sidgwick read a paper on Thought Transference. Numerous experiments had been made, and the successful percipients had been seven in number and were generally hypnotized. One percipient had succeeded in the experiments with numbers, when divided from the agent by a closed door and a distance of about seventeen feet, and the ideas had reached the percipient, as visual impressions recurred with closed eyes, or as hallucinations on a card or paper, and in other ways. Attention was drawn to the fact that only some persons are capable of acting as agents or percipients, and that there is variation in this peculiar ability in the same person on different days, and even at different times on the same day.

The Disgrace of Pinkertonism.

There has been much said and written in the last four weeks about the disgrace of Pinkertonism. Reference has been had in this verdict to the character of the Pinkerton system and of the Pinkerton guards. But there is another disgrace that ought to be emphasized in this connection—the disgrace of a condition of things that requires the importation of dare-devil men to secure rights which local authorities do not guarantee. It is disgraceful that men cannot be secured in the possession of their own property, disgraceful that men cannot go to work except at the risk of their lives in an establishment from which others have voluntarily withdrawn. It would be well for those who join in the general cry against Pinkertonism to have a serious thought or two about the disgraces that are the occasion of Pinkertonism.—*Iron Trade Review.*

The New Star in Auriga again Visible.

Professor Edward S. Hilden telegraphs from the Lick Observatory that the new star that appeared in the constellation Auriga last February, and which faded to about the fifteenth magnitude, so that it appeared very faint through the big telescope, was observed again recently by Professors Schaeberle and Campbell and himself. He says the star has increased in brightness in a surprising manner, being now often and one half magnitude. The present observations, he says, will enable astronomers to get something like a complete history of the remarkable changes to which the star has been subjected.

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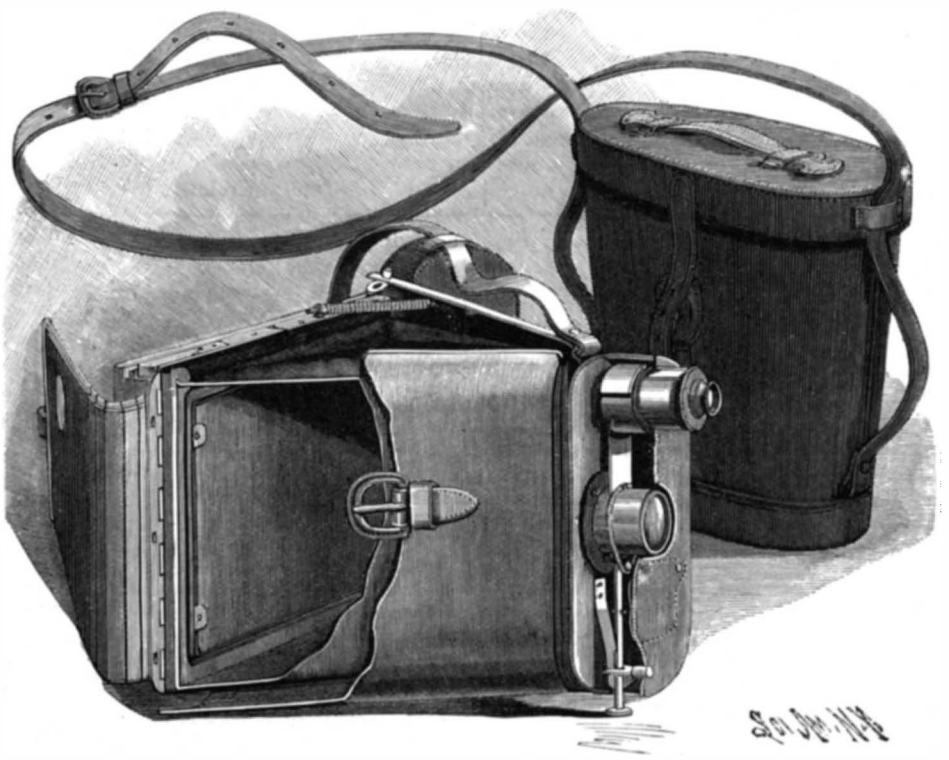
A FIELD GLASS CAMERA.

A camera which, when folded, has the appearance of a field glass case with shoulder strap attached, is shown in closed and open position in the accompanying illustration, the view of the case when open, as it would be used in taking pictures, having parts broken away to show the interior. By pushing in small pins on each side a spring catch is released, and the camera is thrown into wide open position for the reception of a plate holder at the rear. The lens is in the narrow front end of the case, and is covered by a shutter, operated in a simple manner to give instantaneous exposures, there being also a sliding cover which may be used for time exposures. The finder is at one side of the lens, and may be turned so that the sight may be used to take pictures both ways of the plate, either vertically or horizontally. The plates are 3¼ by 4¼ inches in size, each holder carrying two plates. A number of the holders may be conveniently carried in the pocket. The case being opened, the plate holder is introduced, the shutter set, and the flexible slide withdrawn, as shown in the view, when it is only necessary further to press the finger on the button near the objective. The whole process is but the work of a moment, and, the instrument having a first class objective, an excellent picture can ordinarily be obtained. This camera seems to be an almost ideal hand apparatus, as it has the appearance simply of a glass such as travelers frequently carry. The frame is of metal, but is quite light, and is covered with yellow or black leather, the whole construction being designed to render the apparatus equally useful in all climates, thus especially fitting it for the use of explorers and tourists.

This camera is of foreign manufacture and is imported and introduced here by Mr. L. Manasse, of No. 88 Madison Street, Chicago.



A FIELD GLASS CAMERA.

Relics from Denmark.

The peat bogs of Jutland, Denmark, have been yielding some very remarkable symbolic records in the shape of plates of silver, hammered out with figures of men, women, and animals. The eye holes of the figures are now empty, but had evidently been filled with glass. One of the plates, which is nearly seventeen inches long, shows warriors, with helmets and other ornaments. One figure is a god with a wheel at his side, and on another are two elephants. A third shows a horned god in a sitting posture with his legs crossed orientalwise. All these have apparently nothing to do with northern mythology, as was first supposed. The whole find has now reached the Danish National Museum, and we see that these pieces belong to the godlore of the Gallic peoples. The god with the wheel, for instance, is the Gallic sun god. The whole is the work of a Gallic artist at that early period when the Roman and Gallic peoples first came in contact. Allowing time for these things to wander so far north, the date would seem to be, as regards Denmark, the first century before Christ. Other things belonging to this Gallic group have been found previously in this country. The total weight of precious metal hitherto exhumed is about twenty Danish rounds.—*Amer. Antiquarian.*

Dangers of Ammonia.

BY PROF. W. K. BURTON.

The author says in *Photographic Work:* I protest against the very strong ammonia made particularly for photographic work, because of its highly dangerous nature, because such ammonia is always of very uncertain strength a little time after the bottle has been opened, on account of its great volatileness, and because there is so slight an advantage in this exceeding concentration.

The following accident has twice happened with the writer: A bottle of ammonia was opened. For a few seconds nothing took place, but then suddenly ebullition began at the bottom of the liquid, and three quarters of the contents of the bottle were violently discharged against the ceiling of the room. The force of discharge may be judged when I say that in one case the room was thirteen feet high and the bottle was on the floor when it was opened.

In neither of these two cases was there any serious result. In one (the bottle holding half a gallon), the occupants of the house had to take to the street, and could not enter the house again for some half hour or so.

I have, however, recently heard of a case where the contents of a bottle of ammonia discharged themselves as I have described, and a part of the liquid being blown into the eye of the operator, he totally lost the use of that organ.

In England this very strong ammonia is bad enough, but in climates where the weather is sometimes hot it is much worse. With the thermometer above 90° F. in the shade I would much rather handle nitro-glycerine than "0·88 ammonia."

And how small is the gain from this extreme concentration! Why was it ever considered necessary to have a stronger ammonia than the liquor ammoniæ fortior of the British Pharmacopœia? The specific gravity of this ammonia is 0·891, it contains only about 10 per cent less actual ammonia than "0 88 ammonia," yet is far less dangerous.

I should, however, strongly advise the adoption of ammonia of 0·9 specific gravity as a standard for photographic purposes. Such a liquid contains about 20 per cent less ammonia than "0·88 ammonia" (involving an increase in the quantity of solution used of one quarter, or 25 per cent). It is much less liable to lose strength by volatilization, and it is not nearly so dangerous as the very concentrated ammonia made for photographic purposes.

Baldness and its Treatment.

There are two classes of patients who resort either to the profession or to quacks—generally to the latter—for aid in the production or reproduction of hair in those parts of the scalp or face where it ought to grow, but owing to age or disease fails to do so. There is, first, the youth who from vanity or a desire to improve his chances of employment wishes to don before his time those hirsute appendages which are universally regarded as the outward sign of manhood. To him, in spite of the confident assertions of nostrum advertisers, we can offer little beyond the poor consolation, of which he is well aware, that time is not only the sure, but almost the only remedy. No doubt those means which promote an increased circulation in the skin of the face will also promote the nutrition of the hair, and therefore, but only within narrow limits, increased growth in the more vascularized region. This doubtless is to a large extent the *modus operandi* of shaving, which, it is well known, increases the vigor of the hair in the region operated upon. The good effect of the slight irritation of the razor on the callow chin must not, however, be used as an argument for the application of stronger irritants, and the young man who, in his eagerness to hasten a natural process, painted strong acetic acid on his cheeks in the then approved mutton-chop shape not only excited inflammatory redness and brought ridicule on himself, by publishing his youthful yearnings to all beholders, but also, by the inflammatory exudation produced, injured the nutrition of the follicles and hindered rather than helped forward the growth he so much desired. On the whole, patience, *plus* the adoption of all means which promote general invigoration of the system, and the avoidance of excesses of all kinds, is the best advice that can be given to the beardless boy.

The second class, apart from those who have a definite disease like alopecia areata, comprises those who are losing their hair prematurely, or even as a result of advancing age, and it is among these that the venders of hair restorers find a ready market for their wares. It would take up too much space to discuss all the causes of baldness, which may be either of local or general origin, or of the two combined; but it is too much the custom, instead of investigating carefully into the general health and circumstances of the patient, and the exact condition of the skin of the scalp, to prescribe a hair lotion in which may generally be found as the principal ingredient cantharides in some form or other. This, by attracting an increased blood supply to the part, is often useful, no doubt, where the baldness is due to mere sluggishness of the cutaneous circulation, but it fails altogether to reach the cause of that very large class who lose their hair from seborrhœa capitis. This is benefited by microbicide remedies—sulphur, mercurial applications of almost all kinds, and many other antiseptic drugs, both new and old. We do not know what particular microbe, among the legion which may be found in the greasy and dry scales in seborrhœa, produces the proliferation of epithelium, which, according to Unna, is directly due to an inflammatory process; but the effect on the follicle is such that it leads to atrophy of the hair, and if the disease is not arrested, atrophy of the whole follicle and consequent permanent alopecia.

Where the damage to nutrition is not so great, the hair is lusterless and more or less marked canities ensues, and then the hair restorers, which color the hair from without and not from within, are eagerly resorted to. Sulphur and acetate of lead form frequent ingredients of these applications, while perchloride of mercury is too frequently the leading ingredient of a large number of vaunted remedies. No doubt it is of high value as a microbicide when employed in suitable cases, but used indiscriminately for months or even years injurious effects may be, and sometimes are, produced. Pilocarpine, hypodermically injected or given internally as tincture of jaborandi, is certainly of value as a direct promoter of the growth of hair, but it is too powerful a remedy for indiscriminate use, and the copious perspirations and sometimes the cardiac depression it induces should keep its employment within narrow limits. Less direct means may be found in tonics of iron, strychnine, quinine, etc.; but more powerful are cod liver oil and change of air, generally to a bracing climate. It will be seen from the foregoing remarks that baldness is a sympton of such diverse conditions that there is no routine treatment for it, but the cause must be carefully sought out and intelligently treated, while the local treatment must be diligently and perseveringly carried out, as when due to its most common cause, seborrhœa, relapses are the rule, and constant watchfulness against recurrence is accordingly required. —*Lancet.*

The Saxon Tunnel Works Suspended.

In consequence of the fall in the price of silver, the Saxon government has decided not to complete its work on the Rothschoenberger Stollen, which, if completed, would be the longest tunnel in the world. The tunnel was intended to drain the water from all the Freiberg silver mines and carry it to the Elbe. The main tunnel is 9 miles long, but its branches add 21 miles to its length, making the total extent almost 30 miles. The tunnel was begun at state expense in 1844, and after thirty-three years of continuous work it was opened in April, 1877.

Hundreds of men are thrown out of employment by the government's decision, and it is expected that many more will follow, as the Freiberg mines cannot be worked without great loss at the present price of silver, Work in the mines was begun in 1200, and since that time the mines have produced 9,500,000 Prussian pounds, equal to 151,860,500 troy ounces of silver.

Electric Luminosity of Vacuum Tubes.

In the course of a discussion before the British Association on a paper by Professor Schuster on "Primary and Secondary Cells," Mr. Crookes stated that if a long vacuum tube containing oxygen exhausted to a point giving the greatest luminosity is held somewhere near a plate connected with one of the terminals of a high tension coil, it becomes very luminous. If the tube has been lighted and put in a cool, dark place, and thereafter held near a coil, it remains dark, and no amount of placing it near the coil will make it luminous. If the tube is rubbed, it suddenly flashes into luminosity, and remains so; but if laid down in a dark room for an hour, it becomes non-sensitive again. It seemed to him that the gas inside the tube requires to be put in a state of disassociation. Professor H. Von Helmholtz, who was one of the lions of the meeting, said he believed that in these vacuum tubes, if there is a little stratum of gas adhering to the surface there are always molecules, which can be separated into positive and negative. There is really a measurable stratum of air adhering to the interior of the glass tubes. If a rarefied vacuum is made, the greater part of that air goes away; but there are always traces of gas left, even in the vacuum of a glass tube which is completely melted.

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[FOR THE SCIENTIFIC AMERICAN.]

On a Cholera Ship in 1853.

I lived in Bangor, Maine, in 1849 and 1850, when the Asiatic cholera visited that city. I had a contract for a large lot of doors and sash for the United States government to be shipped to California for some government building, I then being in that business.

I had but fairly commenced on the work when the scourge broke out. My partner, a Mr. Wing, fled with his family to the country. Deaths were soon rated at one to two hundred daily. People there were generally panic-stricken, and the city was deserted. Many of my workmen left, so I mustered all of the pluck and courage that nature gave me and determined to live or die at my work bench. My family, then only wife and one child, lived a little out of the city. At 7 o'clock every morning I was in my workshop, and 10 to 11 o'clock at night often found me there. Coffins could not be supplied in sufficient quantity to bury the dead, and I was besought to make coffins, but my government contract prevented my doing so.

While at my work bench I saw one man die in a dirty cellar kitchen. There were few if any regular funerals, but daily coffins or boxes with the dead were seen going with the poor victims to their final rest. It commenced there in the lowest, filthy localities of the place, and from there went among the richest localities. I could form no other verdict than it being a scourge of *intemperance, dirt, and filth* and of *very high livers.* I did not change my method or style of living; ate fresh vegetables, fruit, meat, and melons. I had never poisoned myself with tobacco, beer, or spirituous liquors of any kind, took my baths regularly, and lived as cleanly as possible.

There was a medical fraternity called the Hot Crops, and they had what was then called a Hot Crop hospital. The very first thing that they did was to give a cholera patient a dose so hot that it would almost burn his vital organs. I tasted the stuff, and it was like eating red peppers, that would make the tears run, and it was admitted that they were the most successful of any class of practitioners. It died out with the fall frosts, and there ended the most terrible scourge that I was ever witness of or ever hope to see again. I lost money on my contract, but got out alive.

December 7, 1852, I sailed from New York City on steamer Uncle Sam for California, via the Isthmus of Panama. We were seven days on that filthy malaria and turkey buzzard region, with a railroad to the Chagres River only, where we were boated by natives in almost a nude state up the river to Cruses, and from there on mule back or on foot (the latter I chose) until we reached Panama. There we took the steamer Cortez, with as stern an old sea captain as ever stood before a mast. I had a second cabin ticket. Imagine going from the State of Maine in midwinter, with the system and blood prepared for 10° below zero, and in a few days in a tropical climate at 100 to 110 in the shade, and one imagines the change and contrast! No sooner had we left land than a high fever set in, and such a headache I never bore in my life. My first thought was ice water, but ice could not be bought. The small amount was used only at the bar. I watched where the bartender came to get it out of a small room. I stood there with my blanket, and as his back was turned I grabbed a piece quite the size of a water bucket, rolled it up and slipped around the corner and off, rolling it up and hiding it, and the last I heard of the bartender was "Stop that man!" but I did not stop until I had my prize hid safely in the bow of the ship. I then got a lady to sew a piece of oil silk together and make me a bag. I slept three days and nights by my ice, punching off small pieces, and swallowing them and keeping a little in my oil silk bag on my forehead. When my ice was gone my fever went with it and I was on deck again.

The second day out from Panama death commenced from Panama fever, as it was called, and such a condition as there was among the poor steerage passengers cannot be described, and myself one of a very few who was able to render any assistance. I went to the old captain and begged him to allow me to take a few dainties from the cabin to the poor steerage passengers. At first he refused, but I pleaded so hard that he finally yielded and took me to the head steward and gave directions to only allow me to take anything out of the cabin, and cautioned me to be extremely prudent and cautious, which I was. Soon the Asiatic cholera broke out, and a poor victim would die in terrible agony inside of an hour. They would be apparently well, and all at once in terrible agony, so that they could not stand, and then in a short time all was over and the body sewed up in a blanket and the feet weighted, and they were slid off a board behind the wheel after reading the Episcopal burial service. The mighty deep was their grave.

I finally persuaded the mate and ship physician to make beds in clear weather on the bow deck, and all that were possibly able to be got there were taken. This gave them fresh sea air, and, I think, saved many lives. But as near as I could keep count about 70 out of 700 passengers died on that cholera-stricken ship. It was said to be the most fatal trip to the Golden State up to that time.

J. E. EMERSON.

Plumbiferous Glass Wool.

In the course of gas-analytic operations the author caused gases containing sulphureted hydrogen to traverse a plug of fine white glass wool, as obtained in commerce. The wool was blackened, and on further investigation it appeared that the blackening was due to the formation of lead sulphide. Hence a plumbiferous glass had been used for the production of the glass wool. In various analytical operations where glass wool is used the presence of lead is objectionable. Nor can such material be used, as recommended, for filtering acids, since they may become contaminated by taking up lead.—*L. Blum, in Zeitschrift fur Anal. Chemie*, xxxi.

THE sailing ship Roanoke, launched at Bath, Me., lately, is said to be the largest wooden ship afloat. Her length is 311·2 ft.; breadth, 49·2 ft.; depth, 29·2 ft.; height under spar deck, 9 ft.; gross tonnage 3,539 and net tonnage 3,400·4. She is designed for the California trade.

RECENTLY PATENTED INVENTIONS.

Mechanical.

WRENCH.—John Ryan, New York City. This is a wrench composed of but few parts, each of which can be economically and strongly made, and the wrench can be quickly and conveniently operated wherever a pipe wrench is to be employed. The sliding section of this wrench has a longitudinal slot around which are teeth, and the locking device consists of a pin turning in the shank or the fixed section and passing through the slot of the sliding section, a toothed locking plate engaging with the teeth of the sliding section and carried by the pin.

TOOL HANDLE.—Albert Landon and Louis Martel, Rutland, Vt. This invention provides a simple and durable handle capable of containing a number of tools—such as a putty knife, screw driver, and awl—the tools when not in use being concealed in the handle without being removed from attachment thereto. A lock or latch which keeps the cover of the handle closed is used to throw the tools up from the handle so they may be grasped. While one tool is rigidly held in operative position the others are concealed and locked in the handle. This combination device may be carried in the pocket.

BORING MACHINE.—Jonathan W. Day, Crystal Springs, Miss. This is a novel contrivance for boring inclined apertures into the stumps of trees to form draught channels to facilitate the burning out of the stumps, or for boring apertures in logs, timber and other articles. It consists of a truck frame on which are mounted inclined slotted ways, in which slides a frame with a crank-shaft carrying a gear adapted to operate an auger mounted in the frame. The machine is of simple and strong construction and can be readily moved about from place to place.

MORTISING MACHINE.—Erik J. Gisvold, Eagle Mills, Mich. This invention provides a moderate priced machine, with readily adjustable attachments, for use in cutting base blocks, corner blocks, and finishings for the interior of houses, or the machine may be readily converted into an implement for use as an ordinary mitering machine or a dadoing machine. Attachments are also provided for the machine whereby shingles may be cut in a number of fancy shapes.

Miscellaneous.

SCALE ATTACHMENT.—Louis F. Robare, Au Sable Forks, N. Y. This invention provides a simple and durable construction designed to render the beam noiseless at the fork, contacts made of soft material being arranged at the contacting points of the scale beam with the fork. On the underside of the end of the beam is a contact of rubber or other soft material, so that when the beam swings downward the noise is deadened when the contact strikes the cross bar. The locking lever is formed with a fork in which is journaled a rubber roller, adapted to engage the top of the beam end, thus deadening the noise when the beam swings upward.

SEALING DEVICE.—Ludwig Wurzburg, London, England. As an improved article of manufacture, a nail for use in sealing boxes, etc., is provided by this invention, the nail having a split shank, whose lower portion has one or more transverse apertures adapted to receive a sealing wire or cord, or a combination of two or more flanged nails may be similarly used. By means of this improvement a box, case or package may be fastened in such a manner as to indicate whether or not it has been tampered with.

SHAFT TUG.—Joseph L. Gregory, Washington, Mo. This tug is made of two metallic sections screwed together, and having flanges around their inner edges forming a groove in which a packing ring of leather or similar substance is held to project, to constitute a cushion upon which the shaft is supported, and against which it may rub and strike. The shaft is thus held from contact with the metal frame and jar and rattling are avoided.

RICE SCOURER.—Squire A. Pickett, Crowley, La. In a nearly cylindrical casing supported on a suitable frame, and having a feed hopper at the top and damper openings at the bottom, a shaft carrying pairs of beaters is arranged to be rapidly revolved. In the lower half of the casing are openings closed by gratings or wire netting, affording ventilation to prevent undue heating of the rice, and permitting the dust and scoured-off rice skin to escape.

PLANER FOR ICE ELEVATORS.—William H. M. Smith, Brooklyn, N. Y. The planer body is, according to this invention, held at an inclination above the elevator, and provided with several series of knives, one in rear of the other, the knives of the several series being in alignment, while means are provided for adjusting the inclination of the planer body and locking it in position. The machine is also especially designed to facilitate the removal of snow ice from the ice blocks in a manner to prevent the waste of good ice.

FOLDING BED.—William S. Nevins, Terre Haute, Ind. This invention provides a bed of simple and inexpensive construction which may be manipulated without the use of weights. The bed is pivoted within a casing, to the base of which and to the head portion of the bed back of the pivot springs are attached, while spring-pressed levers fulcrumed in the base have constant bearings upon projections formed at the sides of the bed. Handles on the sides of the bed are adapted to engage latches on the sides of the casing. In the back of the casing are shelves on which may be placed pillows or surplus bedding.

MILK RECEIVER.—Silas J. Morgan, La Grange, Ill. A box or casing with chutes to receive and conduct milk and cream to receptacles has been designed by this inventor, the box having scales to weigh the milk as delivered and a pocket for the reception of tickets, while an indicator visible from the exterior notifies the milkman of the required quantity of milk for which the scales and receptacle have been arranged.

STEREOPTICON AND MAGIC LANTERN DEVICE.—Horace W. Force, Newburg, N. Y. This invention covers a novel slide and shutter, with connected mechanism, for the successive exposure of different pictures in such manner that there will be a practically instantaneous change of views, without showing them in motion on the screen. The mechanism is so arranged that the shutters close and open while the carrier is stationary, the improvement also dispensing with the necessity of using in all cases a "double dissolving" instrument.

BOW FOR STRINGED INSTRUMENTS.—Emil A. Kretschmer, Horicon, Wis. A slide mounted on the bow staff, according to this invention, has a transverse threaded aperture through which a screw extends into contact with the staff, the head of the screw having a concave outer face to receive the end of the thumb. This improved bow is designed to enable the player, especially a beginner, to more readily hold the bow in correct, easy position, without danger of its slipping.

BRACELET.—Louis Cremonesi, New York City. This bracelet consists of an endless spring formed into a series of open loops and links held to span every two loops, the links being doubled around the loops and having widened and inwardly curved free ends. The bracelet has a good deal of elasticity, so that it may be made quite small and still be readily slipped over the hand. The construction favors its manufacture in very effective designs.

POUND NET.—George Williams and Albert A. Cleveland, Astoria, Oregon. This net consists of a lead proper, heart, tunnel, and pot, of the ordinary construction, but with guards arranged in series alongside of and a short distance from the lead, the guards being short lengths of net and spiles in hook shape, with the end of each guard section lapped slightly past the adjacent end of the next section, whereby the fish meeting the lead of the net will be prevented from drifting back too far away from the lead, and their entrance into the heart and pound will be insured.

HANDLE HOLDER FOR BRUSHES, ETC.—William E. Barnett and Bennet R. Chalk, Mount Washington, Md. This device comprises two separated sockets, between which the handle is pivoted, provided with opposite lugs adapted to extend into the sockets and be there secured. By this means the handle may be fixed at one or the other side of the brush, and conveniently changed from side to side to equalize the wear.

Designs.

SPOON.—Richard E. Acton, Alexandria, Va. This spoon has on its handle end a miniature likeness of Gen. George Washington in court dress, his right hand grasping a staff and his left resting on his sword, while within the bowl is a representation of the old Christ Church at Alexandria, Va., which Washington attended.

METAL BORDER.—Charles Osborne, New York City. The leading feature of this design is a serpentine figure in relief, its surface having a roughened, bark-like effect, while at alternate bends are flower-like figures, making a metal border especially adapted for dishes of various kinds.

TRIMMING.—Charles Lexow, Rosebank, N. Y. This design presents loops and sets of straight lines, all radiating from a common center on a band, rope, or braid-like figure, producing a rib of semicircular or circular cross section.

TRIMMING.—Henry M. Sacks, Madison, N. J. A series of connected scallop or crescent-like figures is presented by this trimming, the upper portion having a cord-like appearance and the remaining portion having a fringed, feathery, or fur-like effect.

TRIMMING.—Henry M. Sacks, Madison, N. J. This design presents a series of spire-like figures having a cord-like effect, each figure having a central stem and curled tendrils at each side, and the figures holding suspended a feathery skirt figure or drapery.

CLASP.—Sara Baxter, New York City. This is an ornamental garment clasp, with two body portions, one representing a spread eagle and the other a Maltese cross on which is a five-pointed star, the clasp chains extending from the bill of the eagle to the top of the cross.

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(4532) W. J. P. asks: 1. Suppose a horse shoe steel magnet were substituted for the core of an electromagnet and a current of electricity were sent through the wire with which it was wound, would there be any limit to the strength which the magnet would attain? A. In this case a permanent magnet will become stronger if the current is sent in a direction to favor the magnetism. On the other hand, it would be weaker if a current were sent in the opposite direction, and in all probability the polarity of the permanent magnet would be reversed. 2. Explain how four messages can be sent over one wire at the same time? A. This query cannot be answered in the space at our command. You will find it described at length in Prescott's "Electricity and Electric Telegraph." 3. Will the lead foil with which tea chests are lined do for the plates of a secondary cell? What other metals besides lead can be used for the same? A. Lead foil will do for experiment, but it is not thick enough for practical use. 4. Please tell me how to make fulminate of mercury. A. You will find the method of making fulminate of mercury described in almost every work on chemistry, but we advise you not to undertake it, as it is a very dangerous explosive. 5. Please explain the thermostat used in chicken hatchers. A. It generally consists of a compound thermostatic bar made of brass and steel brazed or riveted together and arranged to open and close dampers, or to regulate lamps either directly or through the medium of an electric current.

(4533) J. J. B. asks: 1. How can I obtain pure nitrate of silver from the coin? A. Dissolve the coin in nitric acid, evaporate to dryness, fuse, melt at a low heat, cool, dissolve and filter 2. How can I reduce the coin into pure metallic silver, suitable for electroplating? A. Dissolve in nitric acid, precipitate with salt, filter, and wash, and reduce to metallic silver with dilute sulphuric acid and zinc. 3. Also nickel and ammonia double sulphate. A. This salt you can buy ready made. Or dissolve equal weights of ammonium sulphate and of nickel sulphate in water, evaporate and crystallize. 4. What are the acids or compounds and proportions used to make pure hydrochloric acid? A. Salt and sulphuric acid are caused to react on each other. For 47·5 parts salt, 98 parts of acid are needed. The gaseous hydrochloric acid is collected in water. 5. Is hydrocyanic acid (prussic acid) expensive? If so please state if it would be cheaper to make it in small quantities than to purchase it ready made? A. The dilute acid costs $1 per pound, the concentrated $1.50. It is dreadfully poisonous, and its preparation is exceedingly dangerous, and should not be attempted except by a skilled person. 6. Is there any way that I can temper twist drills that have become untempered by heating while drilling? A. You can temper by ordinary methods, except that they may bend or spring when dipped.

(4534) O. A. J. asks (1) the melting point of bronze phosphor. A. About 1,692° Fah. 2. Are plaster of Paris moulds sufficiently good to cast bronze yokes for dynamo? A. Plaster of Paris will hardly answer for the moulds. You should use sand of the quality used by brass founders. 3. Please describe how I can melt the bronze in a forge. A. You can melt bronze in a forge by building up the fireplace a few inches with brick and making the fire deeper, place the bronze in a black lead crucible in the center of the fire and cover the crucible with a large piece of charcoal. 4. What kind of wheel shall I use for water at 28 pounds pressure per half inch? A. For information on small high pressure water wheels we refer you to the catalogues of the manufacturers of such wheels.

(4535) C. E. F.—Dirty type is generally cleaned by soaking it in cold lye for several days, after which it is washed with hot or cold water. This operation will clean the type but it will not make it as bright as new type. If the type sticks together, it should be soaked in weak ammonia, but if it is copper-faced ammonia cannot be used. It is to be separated by soaking for about a week in weak lye. For thinning ink use inkaline, but anything that reduces the ink detracts from the efficiency. The sample of printing which you send to us is printed in the usual way, and after printing the work is embossed by means of a bronze stamp cut the reverse of the type. The counter dye can be made in several different ways. It is often made from leather, by taking a new belt leather, wetting it well and while it is soft gluing it on the press, then running the impression up the center and letting it remain overnight. In the morning the leather will be hardened and the counter will be ready for use. The sheets are fed face, in in the usual way, without ink.

(4536) P. C. R. asks: How can the contents of a ball be obtained? A. For the contents of a ball or sphere, multiply the cube of the diameter by 0·5236. Why do some boats have their propellers partly out of the water? A. The boats are designed to have the propellers submerged at the deep load line. Is there anything gained by this? A. When light or partly loaded the propellers project above the surface of the water.

Communications Received.

Case of Hydrophobia in a Horse. By G. A. S.

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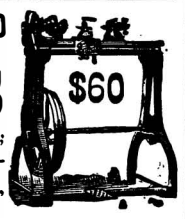

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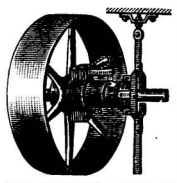
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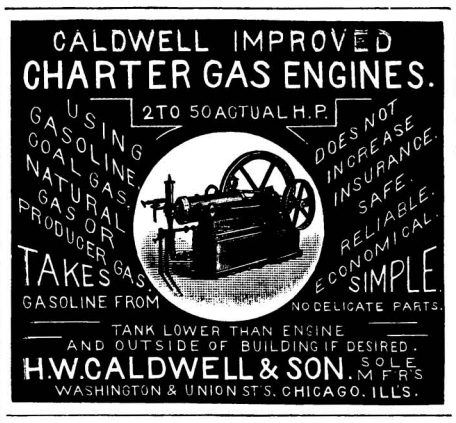
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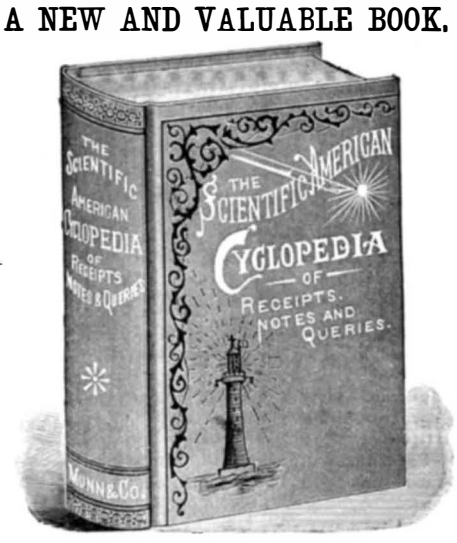

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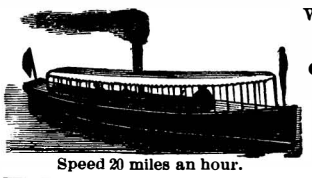

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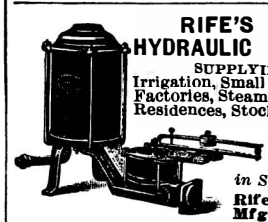

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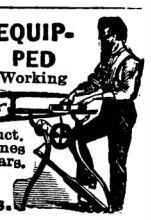

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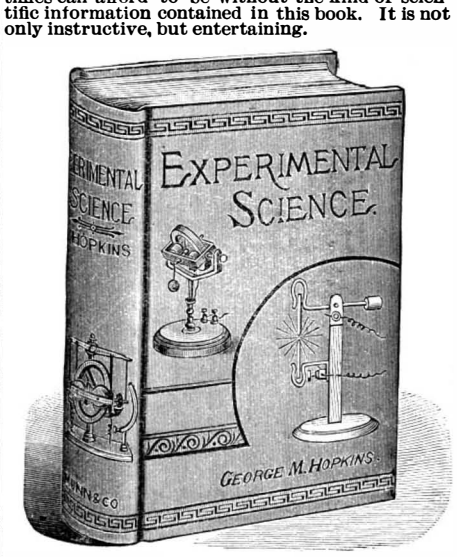

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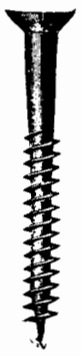

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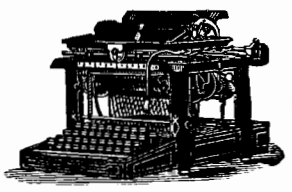

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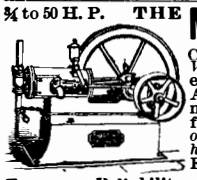

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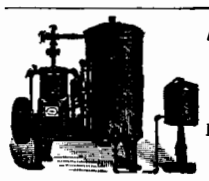

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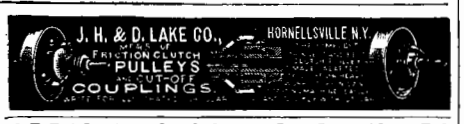

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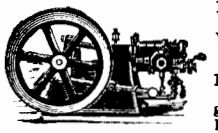

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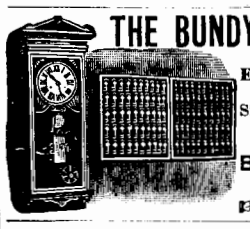

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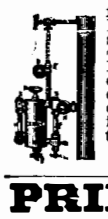

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